SPX®

INSTRUCTION MANUAL

# CombiMag

**Centrifugal pump with magnetic coupling**

CM/EN (1501) 5.4

Orginal instructions
Read and understand this manual prior to operating or servicing this product

Johnson Pump®

# EC Declaration of conformity

(Directive 2006/42/EC, appendix II-A)

**Manufacturer**

SPX Flow Technology Assen B.V.
Dr. A.F. Philipsweg 51
9403 AD Assen
The Netherlands

hereby declares that all pumps member of productfamilies CombiBloc, CombiBlocHorti, CombiChem, CombiDirt, CombiFlex(U)(B), CombiPrime H, CombiLine, CombiLineBloc, CombiMag, CombiMagBloc, CombiNorm, CombiPro(L)(M)(V), CombiPrime V, CombiSump, CombiTherm, CombiWell, FRE, FRES, FREF, FREM, KGE(L), KGEF, HCR, MCH(W)(S), MCHZ(W)(S), MCV(S), PHA, MDR whether delivered without drive (last position of serial number = B), or delivered as an assembly with drive (last position of serial number = A), are in conformity with the provisions of Directive 2006/42/EC (as altered most recently) and where applicable the following directives and standards:

- EC directive 2006/95/EG, "Electric equipment for use within certain voltage limits"
- standards EN-ISO 12100 part 1 & 2, EN 809

The pumps to which this declaration refers may only be put into operation after they have been installed in the way prescribed by the manufacturer, and, as the case may be, after the complete system of which these pumps form part, has been made to fulfil the requirements of Directive 2006/42/EC (as altered most recently).

# Declaration of incorporation

(Directive 2006/42/EC, appendix II-B)

**Manufacturer**

SPX Flow Technology Assen B.V.
Dr. A.F. Philipsweg 51
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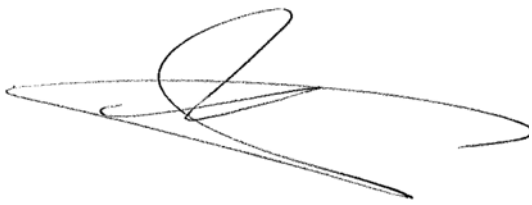
hereby declares that the partly completed pump (Back-Pull-Out unit), member of productfamilies CombiBloc, CombiBlocHorti, CombiChem, CombiDirt, CombiFlex(U)(B), CombiPrime H, CombiLine, CombiLineBloc, CombiMag, CombiMagBloc, CombiNorm, CombiPro(L)(M)(V), CombiTherm, CombiPrime V, FRE, FRES, FREF, FREM, KGE(L), KGEF, HCR, PHA, MDR is in conformity with the following standards:

- EN-ISO 12100 parts 1 & 2, EN 809

and that this partly completed pump is meant to be incorporated into the specified pump unit and may only be put into use after the complete machine of which the pump under consideration forms part has been made and declared to comply with that directive.

Assen, January 1st 2015



G. Santema,

Ad Interim statutory director

# Instruction manual

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SPX is a Fortune 500, global multi-industry manufacturing leader. SPX divides its business into four segments and one of these is the SPX Flow Technology segment. SPX Flow Technology Assen B.V. is part of SPX Flow Technology segment.

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# 1 Introduction

## 1.1 Preface

This manual contains important and useful information for the proper functioning and maintenance of this pump. It also contains important instructions to prevent possible accidents and serious damage and to ensure the safe and smooth functioning of this pump.

! **Read this manual carefully before commissioning the pump. Familiarize yourself with the operation of the pump and strictly obey the instructions!**

The data published here comply with the most recent information at the time of going to press. However they may be subject to later modifications.

SPX reserves the right to change the construction and design of the products at any time without being obliged to change earlier deliveries accordingly.

## 1.2 Safety

### 1.2.1 Magnetic field

Because of the presence of strong magnetic fields, a number of points must be observed:

***Personnel who have a pacemaker should not be allowed to work with the magnetic coupling! The magnetic field is sufficiently strong to affect the operation of a pacemaker. A safe distance is 2 metre!***

***Always keep electronic equipment with memory, cheque cards with magnetic strip, and such like at least 1 metre away from the coupling!***

### 1.2.2 Instructions

The manual contains instructions for the safe operation of the pump. Operators and maintenance staff shall be familiarized with these instructions.
Installation, operation and maintenance has to be done by qualified and well prepared personnel.

A list of the symbols used in the aforementioned instructions as well as their meaning is stated below:

***Personnel who have a pacemaker should not be allowed to work with the magnetic coupling! The magnetic field is sufficiently strong to affect the operation of a pacemaker. A safe distance is 2 metre!***

***Personal danger for the user. Strict and prompt observance of the corresponding instruction is imperative!***

**!** **Risk of damage to or bad functioning of the pump. Obey the corresponding instruction to avoid this risk.**

***Danger of magnetic radiation. Stand equipment which is sensitive to this away from the area around the pump.***

➢ *Useful direction or tip for the user.*

Subjects that require extra attention are printed in **bold** typeface.

This manual has been compiled by SPX with the utmost care. Nevertheless SPX cannot guarantee the completeness of this information and therefore assumes no liability for possible deficiencies in this manual. The buyer/user shall at all times be responsible for testing the information and for taking possible additional and/or deviating safety measures.
SPX reserves the right to change the safety instructions at any time.

## 1.3 Guarantee

SPX shall not be bound to any guarantee other than the guarantee accepted by SPX. In particular, SPX will not assume any liability for explicit and/or implicit guarantees such as but not limited to the marketability and/or suitability of the articles supplied.

The guarantee shall forthwith and legally defunct in case:

- Service and/or maintenance has not been carried out strictly in accordance with the instructions.
- The pump has not been installed and put into in accordance with the instructions in this manual.
- Necessary repairs have not been carried out by our personnel or have been carried out without our prior written consent.
- The articles supplied have been changed without our prior written consent.
- The spare parts used are not original SPX parts.
- Additives or lubricants used are other than those prescribed.
- The articles supplied are not used according to their nature and/or destination.
- The articles supplied are used amateurishly, carelessly, improperly and/or negligently.
- The articles supplied become defective due to outside circumstances beyond our control.

**All wearing parts shall be excluded from guarantee.**

Furthermore, all deliveries are subject to our "General conditions of delivery and payment (last edition)", which will be forwarded to you free of charge on request.

## 1.4 Service and support

This manual is intended for technicians and maintenance staff and for those who are in charge of ordering spare parts.

### 1.4.1 Ordering spare parts

This manual contains the spare - and replacement parts recommended by SPX. A fax-order form is included in this manual. If you have questions or require further information about specific items, please don't hesitate to contact SPX.

### 1.4.2 Pump number

The pump number is stated on the pumps type plate. Please refer to this number and the other data mentioned on the type plate when corresponding or ordering parts.

➢ *These pump data are also stated on the label in the beginning of this manual.*

## 1.5 Inspection of delivered items

Check the consignment immediately on arrival for damage and conformity with the advice note. In case of damage and/or missing parts, have a report drawn up by the carrier at once.

## 1.6 Instructions for transport and storage

***Personnel who have a pacemaker should not be allowed to work with the magnetic coupling! The magnetic field is sufficiently strong to affect the operation of a pacemaker. A safe distance is 2 metre!***

***Always keep electronic equipment with memory, cheque cards with magnetic strip, and such like at least 1 metre away from the coupling!***

### 1.6.1 Dimensions and weight

A pump or a pump unit is generally too heavy to be moved by hand. Therefore, use the correct transport and lifting equipment. Dimensions and weight of the pump or pump unit are shown on the label on the cover of this manual.

### 1.6.2 Use of pallets

Usually a pump or pump unit is shipped on a pallet. Leave it on the pallet as long as possible to avoid damages and to facilitate possible internal transport.

**!** **When using a forklift always set the forks as far apart as possible and lift the package with both forks to prevent it from toppling over! Avoid jolting the pump when moving it!**

### 1.6.3 Hoisting

When hoisting a pump or complete pump units the straps must be fixed in accordance with figure 1 and figure 2.

***When lifting a pump or a complete pump unit always use a proper and sound lifting device, approved to bear the total weight of the load!***

***Never go underneath a load that is being lifted!***

**!** **If the electric motor is provided with a lifting eye, this lifting eye is intended only for the purpose of carrying out service activities to the electric motor! The lifting eye is designed to bear the weight of the electric motor only! It is NOT permitted to lift a complete pump unit at the lifting eye of an electric motor!!**

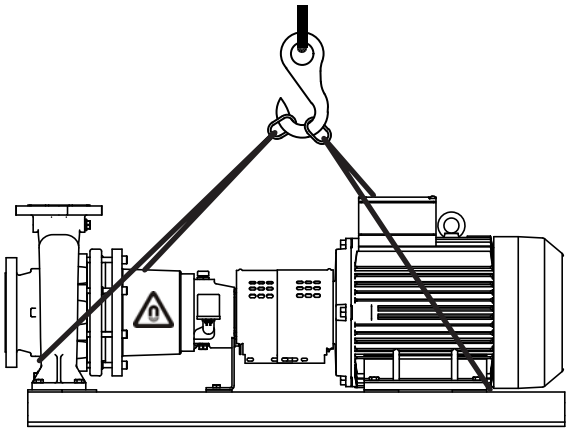

*Figure 1: Lifting instructions for pump unit.*

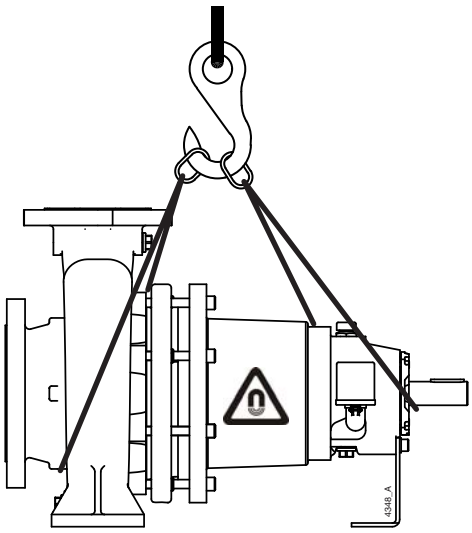


*Figure 2: Lifting instructions for single pump.*

1.6.4 Storage

If the pump is not to be used immediately the pump shaft must be turned by hand twice per week.

## 1.7 Ordering parts

This manual contains a survey of the spare parts recommended by SPX as well as the instructions for ordering them. A fax-order form is included in this manual.

You should always state all data stamped on the type plate when ordering parts and in any other correspondence regarding the pump.

➢ *This data is also printed on the label on the front of this manual.*

If you have any questions or require further information with regard to specific subjects, then do not hesitate to contact SPX.

# 2 General

## 2.1 Type code

Pumps are available in various designs. The main characteristics of the pump are shown in the type code.

Example: **CM 32-250 R6 M3 L1 MAG 110-4**

| | | | | | |
|---|---|---|---|---|---|
| **Pump family** | | | | | |
| **CM** | **C**ombi**M**ag | | | | |
| **Pump size** | | | | | |
| **32-250** | diameter pressure discharge [mm] - nominal impeller diameter [mm] | | | | |
| **Pump casing material** | | | | | |
| **G** | cast iron | | | | |
| **NG** | nodular cast iron | | | | |
| **R** | stainless steel | | | stainless steel, PN20 | |
| **Impeller material** | | | | | |
| **1** | cast iron | | | | |
| **2** | bronze | | | | |
| **6** | stainless steel | | | | |
| **Containment can - Slide bearings** | | | | | |
| | **Containment can** | | | **Slide bearings** | |
| **M3** | Hastelloy C® | | | silicon carbide (SIC) | |
| **Roller bearings** | | | | | |
| **L1** | grease lubricated | | | | |
| **L3** | oil lubricated | | | | |
| **Magnet length magnetic coupling[ cm]** | | | | | |
| **MAG 75** | 2 | 4 | 6 | | |
| **MAG 110** | 2 | 4 | 6 | | |
| **MAG 135** | | 4 | 6 | 8 | |
| **MAG 165** | | 4 | 6 | 8 | 10 |

## 2.2 Serial number

Serial number of the pump or pump unit are shown on the name plate off the pump and on the label on the cover of this manual.

Example: **01-1000675A**

| | |
|---|---|
| 01 | year of manufacture |
| 100067 | unique number |
| 5 | number of pumps |
| A | pump with motor |
| B | pump with free shaft end |

## 2.3 Pump description

The CombiMag is a series of leakage-free horizontal centrifugal pumps which conform to ISO 2858 / EN 22858 (DIN 24256)/ ISO 5199. Flange dimensions, bolt circle and number of holes are in accordance with ISO 7005 PN 16. The pump is driven by a standard foot motor. The power is transmitted through a flexible coupling.

## 2.4 Applications

- In general, CombiMag pumps are suitable for thin, clean and lightly contaminated liquids, without particles which can get magnetized.
- The maximum allowed system pressure and temperature and the maximum speed depend on the pump type and the pump construction. For relevant data see paragraph 10.1 "Maximum allowable working pressures" and paragraph 10.6 "Maximum speed".
- Further details about the application possibilities of your specific pump are mentioned in the order confirmation and/or in the data sheet enclosed with the delivery.
- Do not use the pump for purposes other than those for which it is delivered without prior consultation with your supplier.

⚠ ***Using a pump in a system or under system conditions (liquid, working pressure, temperature, etc.) for which it has not been designed may hazard the user!***

## 2.5 Operation principle

The pump is driven by a standard IEC motor, via an elastic coupling. The motor drives the outer rotor. Inside this outer rotor a number of magnets is fitted, set to the power to be transmitted. The inner rotor, fitted to the impeller shaft, contains the same number of magnets. The magnets of inner and outer rotor face each other a pole pairs. Once the outer rotor starts rotating the inner rotor is driven by the outer rotor. In this way the motor power is transmitted to the inner rotor and the impeller shaft via the outer rotor. A static containment can, located between both rotors, separates the liquid from the atmosphere.

## 2.6 Design

The CombiMag is designed according to a strongly implemented modular construction method. Many parts are interchangeable with parts from other pumps of the Combi-range. This interchangeability makes it possible to convert existing CombiChem pumps, fitted with mechanical seals, to magnetic coupled pumps, where the electric motor, the pump casing, the impeller and the base plate can often be retained.

The most important parts are:

2.6.1 Pump casing / Impeller

For every pump type, the pump casing and the impeller in the various material types are structurally similar and interchangeable. A replaceable wear ring is fitted in the pump casing at the location of the impeller inlet. The rear side of the impeller is fitted with back vanes. These provide a partial balancing of the axial forces acting on the impeller. At the same time, the back vanes support the circulation of liquid through the slide bearings. An important feature is the Back-Pull-Out construction. The impeller section, with the shaft and containment can, can be removed and the pump casing remains in the pipe system.

2.6.2 Intermediate cover

The intermediate cover is the connecting piece between the pump section and the magnetic coupling. The stationary part of the slide bearings and the containment can both are fitted to the intermediate cover. The intermediate cover is connected to the pump casing as a separate element. The intermediate cover is provided with apertures in such a manner that the pumped medium can circulate around the magnets of the inner rotor and the slide bearings. The circulation is kept going by the pressure difference between the external circumference of the impeller and the impeller hub. The intermediate cover is provided with a connection to fit a temperature sensor to the containment can. The bottom of the intermediate cover is fitted with a connection to fit a pressure gauge, but which can also serve as a drain for the inner space of the bearing bracket.

2.6.3 Magnetic coupling

The maximum power transmitted is a motor output of 75 kW at 3000 rpm and 50 kW at 1500 rpm. The CombiMag programme includes 4 magnetic coupling sizes, namely: MAG 75, MAG 110, MAG 135 and MAG 165. The selection of the coupling depends upon the torque to be transferred. The method of construction for the three sizes is identical. The MAG 110 and - 135 even have the same bearing construction. The magnets of the inner rotor are encapsulated by a thin stainless steel jacket which prevents exposure to the liquid.

2.6.4 Liquid lubricated bearings

All axial and radial forces which are generated by the impeller are absorbed by the liquid lubricated bearings. These bearings contain grooves which ensure optimum lubrication and cooling. To ensure a constant lubrication and cooling of the bearing, **solid, non-abrasive particles may not be larger than 0,1 mm** (=the groove cross-section). The slide bearings are shrunk fit into a stainless steel holder and fitted to a silicon carbide shaft sleeve. The shaft sleeve is centred in the axial bearing construction.

2.6.5 Containment can

The containment can is a deep drawn metal can. This can is designed for system pressures up to 2500 kPa (25 bar). The wall thickness of the containment can is such that the torque loss, caused by the occurring eddy currents, is minimal. The containment can material has a decisive influence on the production of heat on site. The can is made of Hastelloy C®. The containment can is fixed to the intermediate stage by means of a welded-on flange and is sealed by a gasket. The containment can separates the liquid to be pumped from the atmosphere.

### 2.6.6 Bearing bracket with drive shaft

The bearing bracket is completely sealed. The outer rotor driven by the electric motor is placed in the bearing bracket. An emergency bearing is fitted to the pump casing side. Should the ball bearings have too much clearance, then there is no possibility that the outer rotor can damage the containment can. The bearing construction consists of 2 deep groove ball bearings. These bearings are subject to light loads because the impeller forces are no longer taken up by this bearing construction and are therefore prestressed. The bearings can be grease or oil lubricated. If grease lubrication is applied then the bearings shall be supplied with sufficient grease for their entire life-span. The bearing bracket is supported by a bracket support. In this way, alignment errors with the electric motor caused by piping forces are kept to a minimum.

## 2.7 Application area

The application area globally looks as follows:

*Table 1: Application area.*

| | |
|---|---|
| Maximum capacity | 550 $m^3/h$ |
| Maximum delivery head | 160 m |
| Maximum system pressure | 1600 kPa (16 bar), optional 2500 kPa (25 bar) |
| Temperature range | -50°C to 300°C |
| Viscosity | 0,3 mPas to 150 mPas |
| Slurry | maximum 5% weight, maximum size 0,25 mm |
| Solids | maximum diameter 0,1 mm, hardness 700 HV |

## 2.8 Re-use

***Personnel who have a pacemaker should not be allowed to work with the magnetic coupling! The magnetic field is sufficiently strong to affect the operation of a pacemaker. A safe distance is 2 metre!***

***Always keep electronic equipment with memory, cheque cards with magnetic strip, and such like at least 1 metre away from the coupling!***

The pump may only be used for other applications after prior consultation with SPX or your supplier. Since the lastly pumped medium is not always known, the following instructions should be observed:

- Flush the pump properly
- Make sure the flushing liquid is discharged safely (environment!)

***Take adequate precautions and use the appropriate personal protection means (rubber gloves, spectacles)!***

## 2.9 Scrapping

If it has been decided to scrap a pump, the same procedure as for paragraph 2.8 "Re-use" should be followed.

# 3 Installation

## 3.1 Safety

Read this manual carefully before installing and commissioning the pump. Non-observance of these instructions may cause serious damage to the pump that is not covered by our guarantee terms. Follow the instructions step by step.

### 3.1.1 Magnetic coupling

Because of the presence of strong magnetic fields, a number of points must be observed:

***Personnel who have a pacemaker should not be allowed to work with the magnetic coupling! The magnetic field is sufficiently strong to affect the operation of a pacemaker. A safe distance is 2 metre!***

**!** **Do not subject the pump to any jolting loads. This can cause damage to the magnets or the ceramic slide bearings on account of their brittleness.**

***Always keep electronic equipment with memory, cheque cards with magnetic strip, and such like at least 1 metre away from the coupling!***

### 3.1.2 Pump unit

- Make sure the motor cannot be started when work is done to the pump- motor combination and running parts are insufficiently shielded.
- The pumps are suitable for liquids with a temperature up to 300°C. As from 65°C the user, when installing the pump unit, should take appropriate protection and warning measures to prevent contact with hot pump parts.
- If danger arises in case of static electricity, the entire pump unit should be earthed properly.
- If there is a danger that the pumped liquid might be harmful to men or the environment, the user should take appropriate measures for safe drainage.

## 3.2 Protection

! **To prevent damage during transportation, the impeller is parked on the inlet flange with a flange. Remove this flange before connecting the inlet pipe. Check whether the pump shaft can be rotated by hand. Keep the flange for subsequent transport, checks or repair work.**

To prevent corrosion, the pump is flushed with a preserving agent before leaving the works. Before putting the pump into operation, drain off any preserving agent and flush the pump thoroughly with hot water.

## 3.3 Environment

- The foundation must be hard, level and flat.
- The area in which the pump unit is to be placed should be adequately ventilated. A too high ambient temperature and air humidity, as well as a dusty environment may have a negative effect on the functioning of the motor.
- Around the pump unit there should be enough space to operate and if necessary repair the pump.
- Behind the cooling air inlet of the motor there should be a free area of at least 1/4 of the electric motor diameter, to ensure unobstructed air supply.
- In case the pump is provided with an isolation, special attention has to be paid To temperature limits of shaft seal and bearing.

## 3.4 Mounting

⚠ ***Ensure that the pump can not be started if work has to be undertaken to the pump during installation and the rotating parts are insufficiently guarded!***

3.4.1 Installation of a pump unit

Pump and motor shafts of complete pump units are adjusted perfectly in line in the works.

1 In case of permanent arrangement place the base plate level on the foundation with the aid of shims.

2 Carefully tighten the nuts on the foundation bolts.

3 Check the alignment of pump and motor shafts and if necessary realign, see paragraph 3.4.3 "Alignment of the coupling".

3.4.2 Assembling a pump unit

If the pump and the electric motor still have to be assembled, do the following:

! **If a flywheel forms part of the delivery this will have to be fitted to the shaft of the electric motor in order to prevent the magnetic coupling from slipping during start-up. See figure 3.**

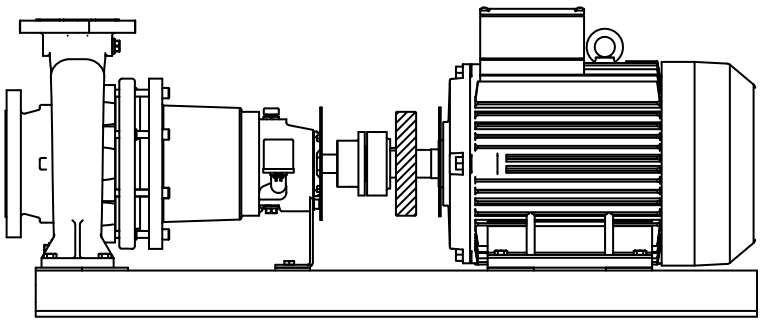

*Figure 3: Fitting the flywheel.*

1 Fit both halves of the coupling to the pump shaft and the motor shaft respectively.

2 If size **db** of the pump, see figure 17, is not equal to the IEC size of the motor, level up the difference by placing properly sized spacers under the pump or under the motor feet.

3 Place the pump on the base plate. Always place shims of 5 mm thickness under the pump feet and under the bearing bracket support. Fix the pump to the base plate.

4 Place the electric motor on the base plate. Always place shims of 5 mm thickness under the electric motor feet. Move the motor to obtain a gap of 3 mm between both coupling halves.

5 Place copper shims under the feet of the electric motor. Fix the electric motor to the base plate.

6 Align the coupling in accordance with the following instructions.

3.4.3 Alignment of the coupling

1 Place a ruler (A) on the coupling. Place or remove as many copper shims as is necessary to bring the electric motor to the correct height so that the straight edge touches both coupling halves over the entire length, see figure 4.

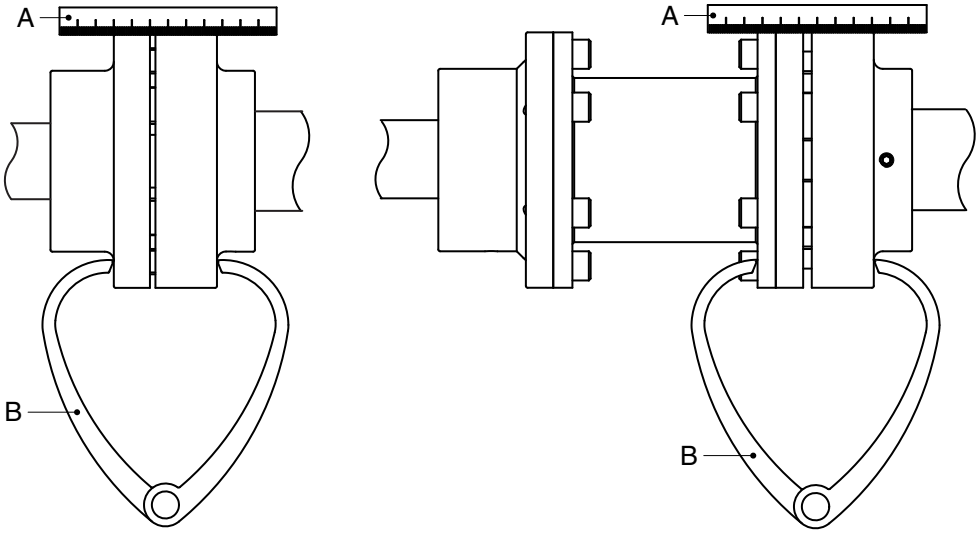


*Figure 4: Aligning the coupling by means of a ruler and a pair of outside calipers.*

2 Repeat the same check on both sides of the coupling at the height of the shaft. Move the electric motor so that the straight edge touches both coupling halves over the entire length.

3 Check the alignment once again using a pair of external calipers (B) at 2 diametrical opposite points on the sides of the coupling halves, see figure 4.

4 Fit the guard. See paragraph 7.7 "Assembling the guard".

3.4.4 Tolerances for aligning the coupling

The maximum allowable tolerances for the alignment of the coupling halves are shown in Table 2. See also figure 5.

*Table 2: Alignment tolerances*

| **External diameter of coupling [mm]** | **V** | | | | **$Va_{max}$ - $Va_{min}$ [mm]** | **$Vr_{max}$ [mm]** |
|---|---|---|---|---|---|---|
| | **min [mm]** | | **max [mm]** | | | |
| 81-95 | 2 | 5* | 4 | 6* | 0,15 | 0,15 |
| 96-110 | 2 | 5* | 4 | 6* | 0,18 | 0,18 |
| 111-130 | 2 | 5* | 4 | 6* | 0,21 | 0,21 |
| 131-140 | 2 | 5* | 4 | 6* | 0,24 | 0,24 |
| 141-160 | 2 | 6* | 6 | 7* | 0,27 | 0,27 |
| 161-180 | 2 | 6* | 6 | 7* | 0,30 | 0,30 |
| 181-200 | 2 | 6* | 6 | 7* | 0,34 | 0,34 |
| 201-225 | 2 | 6* | 6 | 7* | 0,38 | 0,38 |

*) = coupling with spacer

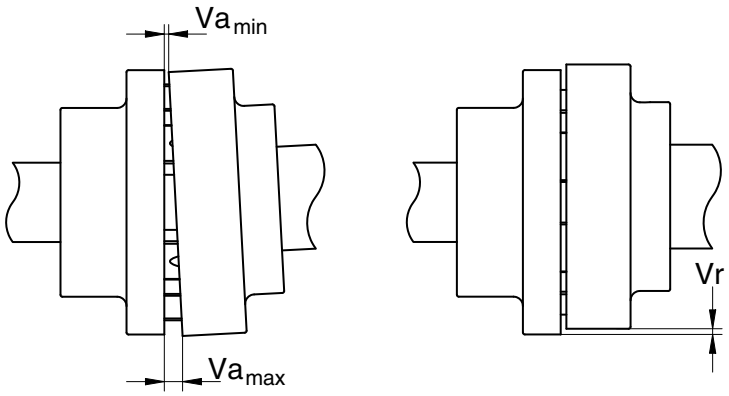


*Figure 5: Alignment tolerances standard coupling.*

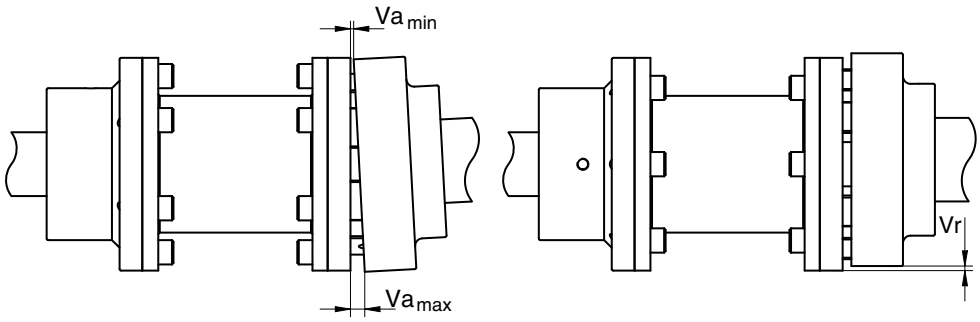


*Figure 6: Alignment tolerances spacer coupling.*

## 3.5 Piping

- The CombiMag is not a self-priming pump, normally the liquid should flow into the pump.
- The piping to the suction and delivery connections must fit exactly and must not be subject to stress during operation. The maximum allowable forces and moments on the pump flanges are stated in paragraph 10.7 "Permissible forces and moments on the flanges".
- The passage of the suction pipe must be amply dimensioned. This pipe should be as short as possible and run towards the pump in such a way that no air pockets can arise. If this is not possible, a venting facility should be provided at the highest point of the pipe. If the inside diameter of the suction pipe is larger than the suction connection of the pump, an excentric reducer should be applied to prevent air pockets and whirls. See figure 7.

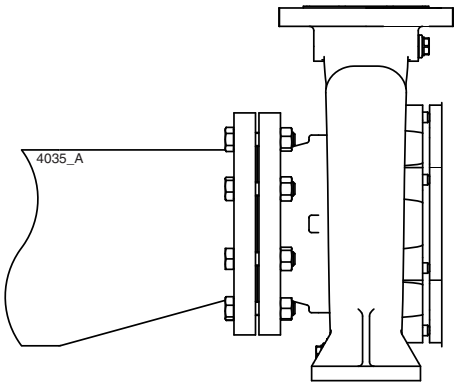


*Figure 7: Excentric reducer to suction flange.*

- The maximum allowable system pressure is stated in paragraph 10.1 "Maximum allowable working pressures". If there is a risk that this pressure might be exceeded, for instance because of an excessive inlet pressure, appropriate measures should be taken by mounting a safety valve in the piping.
- Sudden changes in the rate of flow can lead to high pressure impulses in the pump and the piping (water shock). Therefore, do not use quick-acting closing devices, valves etc.
- Before installing the pump, first flush the piping thoroughly to clean out any dirt, grease or possible particles.
- When mounting, place temporarily (for the first 24 operating hours) a fine gauze between suction flange and suction pipe so as to prevent internal pump parts from being damaged by foreign matter. If the risk of damage continues to exist, mount a permanent filter.

### 3.6 PT100 element

In case the pump is provided with a PT100 element, the connections to the connection head must be made by an approved electrician.

The connection head is provided with a cable gland M20 x 1,5.

See the following wiring diagram for the appropriate connections (rt = red, ws = white).

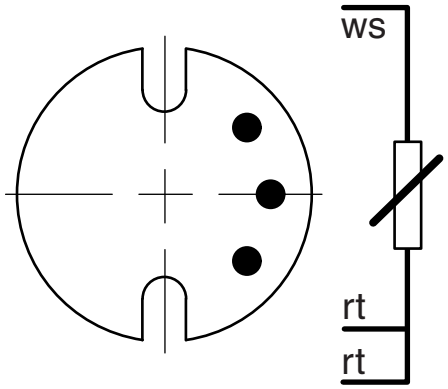


*Figure 8: Connecting PT 100 element*

### 3.7 Connection of the electric motor

⚠ ***The electric motor must be connected to the mains by an approved electrician, according to the locally prevailing regulations of the electricity company.***

- Refer to the instruction manual belonging to the electric motor.
- If possible, mount a working switch as close as possible to the pump.

# 4 Commissioning

## 4.1 Preparation

***Personnel who have a pacemaker should not be allowed to work with the magnetic coupling! The magnetic field is sufficiently strong to affect the operation of a pacemaker. A safe distance is 2 metre!***

***Always keep electronic equipment with memory, cheque cards with magnetic strip, and such like at least 1 metre away from the coupling!***

- Check if the shaft can rotate freely. Do this by turning the shaft end at the coupling a few times by hand.
- Check whether the fuses have been mounted.
- Check that the setting for the thermal protection switch corresponds with the specification on the type plate on the electric motor.

## 4.2 Pumps with oil-bath lubricated bearings

**!** **Pumps provided with oil-bath lubricated bearings are shipped without oil and must be filled with oil prior to commissioning the pump!**

For the specification of the oil to be used, see paragraph 10.4 "Oil lubricated bearing L3".

1 Remove the oil filler cap (2130).

2 Fill the bearing bracket through the oil filling orifice till the oil shows in the constant level oiler.

3 Fit the oil filler cap.

4 Top up the constant level oiler entirely.

## 4.3 Preparing for commissioning

Proceed as follows, both when the unit is put into operation for the first time and after the pump has been repaired:

1 Close the outlet valve, though not entirely, so that air bubbles are always allowed to develop when the pump fills up with liquid via the inlet opening.

➢ *If a non-return valve is fitted to the outlet flange then provide this with a hole (∅4mm), with the same purpose.*

2 Fully open the stop valve in the suction pipe. Fill the pump and the suction pipe with the liquid to be pumped. Some liquid will get into the outlet pipe (approximately 0,5 m static). It may be useful to vent the system to the atmosphere via the connection for this purpose on the outlet flange.

3 Rotate the pump shaft vigorously a few times by hand in a clockwise direction and then a few times anti- clockwise. Stop turning and wait ± 3 minutes to allow the air to escape. Repeat this procedure at least 5 times. Top up the pump as necessary.

## 4.4 Checking the sense of rotation

⚠ ***Beware of possible non-screened rotating parts when checking the sense of rotation!***

1 The sense of rotation of the pump is indicated by an arrow on the bearing bracket. Check if the sense of rotation of the motor corresponds to that of the pump.

2 Let the motor run for only a short time and check the sense of rotation.

3 If the sense of rotation is **not** correct, alter the sense of rotation. See the the instructions in the user manual, shipped with the electric motor.

4 Fit the guard.

## 4.5 Switching on the pump

1 Open the valve in the flushing, cooling or heating liquid supply pipe if the pump is fitted with flushing, cooling or jacket heating.

2 Switch on the pump.

3 Once the pump is up to pressure, slowly open the pressure cock. Check the power consumption of the electric motor.

4 Now open the outlet valve fully until the pump reaches the correct duty point. Check the power consumption again.

⚠ ***Make sure that the rotating parts are always sufficiently guarded when the pump is running!***

### 4.6 Check

If a pump is in operation pay attention to the following:

**! The pump should never run dry.**

**! The pump must never run with a fully closed outlet valve! The following is a guideline for the minimum liquid flow: 20% of the capacity at $Q_{BEP}$.**

When running with a fully closed outlet valve the heat which is generated by the impeller, magnetic coupling and slide bearings will result in the liquid boiling or evaporating. This will result in cavitation/vibration of the pump, serious damage to the impeller and abrupt seizure of the slide bearings.

- Check if the system pressure always remains below the maximum permissible working pressure. For the correct values, see paragraph 10.1 "Maximum allowable working pressures".
- The pump flow must never be controlled by using the stop cock in the suction pipe. This must always be fully open.
- Check if the differential pressure between the suction and the pressure connections corresponds with the specifications of the working point of the pump.
- Check if the absolute inlet pressure is sufficient so that no condensation can form in the pump. This can result in cavitation. The **minimum required inlet pressure** (in m) above the vapour pressure of the liquid being pumped at pump temperature must be **at least 0,5 - 1 m above the NPSH values** of the CombiMag pump (NPSH = Net Positive Suction Head).
- If the motor is running, the valves are not closed and the pressure and capacity of the pump are collapsing while a knocking sound is heard, the magnets are probably slipping and the motor has to be shut off immediately.

**! Cavitation must always be prevented, since this is very harmful to the pump.**

### 4.7 Noise

The noise production of a pump depends to a great extent on the operating conditions. The values stated in paragraph 10.9 "Noise data" are based on normal operation of the pump, driven by an electric motor.

In case the noise level **during normal operating conditions** should exceed 85 dBa, take preventive measures to protect hearing, by placing a noise barrier around the pump or wearing ear cuffs.
**Ensure the operating conditions are NORMAL (=according to spec.) and that the high noise level does not indicate any premature pump failure!**.

# 5 Maintenance

***Personnel who have a pacemaker should not be allowed to work with the magnetic coupling! The magnetic field is sufficiently strong to affect the operation of a pacemaker. A safe distance is 2 metre!***

***Always keep electronic equipment with memory, cheque cards with magnetic strip, and such like at least 1 metre away from the coupling!***

⚠ ***If the pump chamber is sprayed clean, water must not enter the terminal box of the electric motor! Never spray water on hot pump parts! These parts can burst if subject to sudden cooling and the hot pump liquid can then come out.***

! **When the pump must be moved for checking or maintenance, then the impeller should first be fixed to the accompanying flange to prevent damage to the liquid lubricated bearings.**

! **Flawed maintenance will result in shorter lifespan, possible break down and in any event loss of warranty.**

## 5.1 Lubrication of the bearings

5.1.1 Grease-lubricated bearings L1

- The grease lubricated bearing configuration does not require any maintenance.

5.1.2 Oil-bath lubricated bearings L3

- During operation the constant level oiler should never be empty. Take care to top up timely.
- The oil should be changed once a year. If the oil temperature is higher than 80°C, the oil should be changed more often. For recommended oils and quantities see paragraph 10.4 "Oil lubricated bearing L3".

! **Make sure the used oil is discharged safely.**
**See to it that it does not get into the environment.**

## 5.2 Environmental influences

- Regularly clean the filter in the suction pipe or the suction strainer at the bottom of the suction pipe, as the inlet pressure may become too low if the filter or the suction strainer is fouled.
- If there is a risk that the pumped liquid expands during solidification or freezing, the pump has to be drained and, if necessary, flushed after it has been put out of service.
- If the pump is out of service for a long time, it has to be preserved.
- Check motor for accumulation of dust or dirt, which might influence motor temperature.

## 5.3 Noise

If a pump starts making noise, this may point to certain problems with the pump unit. A crackling noise can indicate cavitation or excessive motor noise can indicate deterioration of the bearings.

## 5.4 Motor

Check motor specifications for start-stop frequency.

## 5.5 Faults

⚠ ***The pump, of which you want to determine the fault, may be hot or under pressure. Take the appropriate precautions first and protect yourself with the proper safety devices (safety goggles, gloves, protective clothing)!***

To determine the source of the malfunctioning of the pump, proceed as follows:

1 Switch off the power supply to the pump unit. Lock the working switch with a padlock or remove the fuse. In case of a combustion engine: switch off the engine and close the fuel supply to the engine.

2 Close the stop valves.

3 Determine the nature of the fault.

4 Try to determine the cause of the fault with chapter 6 "Problem solving" and take the appropriate measures or contact your installer.

# 6 Problem solving

Faults in a pump installation can have various causes. The fault may not be in the pump, it may also be caused by the pipe system or the operating conditions. Firstly, always check that installation has been executed in accordance with the instructions in this manual and that the operating conditions still correspond with the specifications for which the pump was purchased.

In general, breakdowns in a pump installation are attributable to the following causes:

- Faults with the pump.
- Breakdowns or faults in the pipe system.
- Faults due to incorrect installation or commissioning.
- Faults due to incorrect choice of pump.

A number of the most frequently occurring failures as well as their possible causes are shown in the table below.

***Personnel who have a pacemaker should not be allowed to work with the magnetic coupling! The magnetic field is sufficiently strong to affect the operation of a pacemaker. A safe distance is 2 metre!***

*Table 3: Most frequently occurring failures.*

| Most common faults | Possible causes |
|---|---|
| Pump delivers no liquid | 1 2 3 4 8 9 10 11 13 14 17 19 20 21 27 29 43 |
| Pump has insufficient volume flow | 1 2 3 4 8 9 10 11 13 14 15 17 19 20 21 28 29 |
| Pump has insufficient head | 2 4 13 14 17 19 28 29 |
| Pump stops after start up | 1 2 3 4 5 6 7 8 9 10 11 |
| Pump has higher power consumption than normal | 12 15 16 17 18 22 24 25 26 27 38 39 |
| Pump has lower power consumption than normal | 13 14 15 16 17 18 20 21 28 29 43 |
| Pump vibrates or is noisy | 1 9 10 11 15 18 19 20 22 24 25 26 27 28 29 37 38 39 40 |
| Bearings wear too much or become hot | 24 25 26 27 37 38 39 40 42 |
| Pump running rough, hot or seizes | 18 24 25 26 27 37 38 39 40 42 |

*Table 4: Possible causes of pump failures.*

| | **Possible causes** |
|---|---|
| 1 | Pump or suction pipe not sufficiently filled or vented |
| 2 | Gas or air coming from the liquid |
| 3 | Air lock in the suction pipe |
| 4 | Suction pipe leaks air |
| 8 | The manometric suction head is too high |
| 9 | Suction pipe or suction strainer is blocked |
| 10 | Insufficient immersion of foot valve or suction pipe during operation of the pump |
| 11 | NPSH available too low |
| 12 | Speed too high |
| 13 | Speed too low |
| 14 | Wrong sense of rotation |
| 15 | Pump does not work at the correct duty point |
| 16 | Liquid density differs from the calculated density |
| 17 | Liquid viscosity differs from the calculated viscosity |
| 18 | Pump operates with too low liquid flow |
| 19 | Wrong pump selection |
| 20 | Obstruction in impeller or pump casing |
| 21 | Obstruction in the piping system |
| 22 | Wrong installation of the pump unit |
| 24 | Rotating part running out of true |
| 25 | Rotating parts out of balance (i.e. impeller, magnetic coupling) |
| 26 | Pump shaft running out of true |
| 27 | Bearings faulty or worn / Slide bearings faulty or worn |
| 28 | Wear ring faulty or worn |
| 29 | Impeller is damaged |
| 37 | Axial retaining of impeller or pump shaft is defective |
| 38 | The bearings have been fitted incorrectly |
| 39 | Too much or too little bearing lubrication |
| 40 | Wrong or polluted lubricant |
| 41 | Contaminants in the liquid |
| 42 | Too high axial force due to worn back blades or excessive inlet pressure |
| 43 | Magnetic coupling slips as a result of points 24, 27, 28, 29 or 37 amongst others |

# 7 Disassembly and assembly

## 7.1 Precautionary measures

### 7.1.1 Magnetic coupling

***Personnel who have a pacemaker should not be allowed to work with the magnetic coupling! The magnetic field is sufficiently strong to affect the operation of a pacemaker. A safe distance is 2 metre!***

***Always keep electronic equipment with memory, cheque cards with magnetic strip, and such like at least 1 metre away from the coupling!***

### 7.1.2 Electric connections

***Take adequate measures to avoid that the motor is started while you are working on the pump. This is especially important for electric motors with remote control:***

- Switch the operating switch near the pump (if available) to "OFF".
- Switch off the pump switch on the switchboard.
- If necessary remove the fuses.
- Hang a danger board near the switchboard cabinet.

### 7.1.3 Jacket

***In case the pump is equipped with jackets, ensure the liquid lines are shut off and let the pump cool down before proceeding with any disassembly of the pump!***

## 7.2 References

If no specific figure number is stated, all item numbers mentioned in the instructions below, refer to the parts lists and sectional drawings in chapter 9 "Parts".

## 7.3 Draining

**! Make sure no liquid or oil gets into the environment!**

7.3.1 Liquid draining

Before starting any disassembly the pump should be drained.

1 If necessary, close the valves in the suction and delivery pipe and in the flushing or cooling supply lines to the shaft seal.

2 Remove the drain plug (0310).

3 If harmful liquids are pumped wear protective gloves, shoes, glasses, etc., and thoroughly flush the pump.

4 Refit the drain plug.

7.3.2 Oil draining

If the pump is designed with oil lubricated bearings:

1 Remove the oil drain plug (2190).

2 Drain the oil.

3 Refit the oil drain plug.

⚠ ***If possible, wear protective gloves. Regular contact with oil products may result in allergic reactions.***

7.3.3 Draining the jackets

If the pump is provided with jackets, drain them **once the pump has cooled down!**

## 7.4 Precautions

7.4.1 Assembly location

- Remove parts from the workbench which are not necessary for assembly. Magnetic materials (grindings, bolts and such like) can suddenly be attracted to the coupling resulting in damage to the coupling or personal injury.
- In cases where metal workbenches are used, mask the workbench with corrugated fibreboard or another soft material.

7.4.2 Special tools

Assembly and disassembly work requires no special tools. However, such tools can make certain jobs easier, for instance replacing the shaft seal. If such is the case it will be indicated in the text.

7.4.3 Cleaning parts

Cleanse and degrease all joint faces and centring surfaces with methyl alcohol. Preferably use cellulose cleaning cloths for this.

! **Do not use any solvent for the removal of possible dirt. This can affect the non-encapsulated magnets. Any dirt can be removed from the magnets with masking tape!**

7.4.4 Impact loading

The materials used for magnets and slide bearings are highly vulnerable during current surge loading. Therefore pay close attention to the following points:

! **Do not exercise any impact loads on the magnets during assembly and disassembly. This can cause damage to the magnets on account of their brittleness.**

! **Do not exercise any impact load directly on the slide bearing during assembly and disassembly. This can cause the formation of micro-cracks which can lead to serious damage of the bearing.**

! **Impact loads should at all times be prevented during the installation and transportation of the pump or components thereof. The magnets and the slide bearings can be damaged by impact loading.**

## 7.5 Removing and replacing the pump

Either the pump can be removed completely or only the Back-Pull-Out unit can be removed, leaving the pump casing fixed to the base plate and the flanges connected to the piping. In most cases the entire pump will be disassembled, to inspect respectively repair it in the work shop, under clean conditions

- Ensure the shut-off valves are closed and the pump is drained
- Once the pump or the Back-Pull-Out unit is removed, place it on a pallet for further internal transport..

***Place a warning sign close to the pump on the pallet warning against the hazards of the magnetic field!***

***Place a warning sign close to the pump on the pallet warning against the harmful effects of the magnetic field!***

## 7.6 Back-Pull-Out system

The pumps are designed with a Back-Pull-Out system. If the pump unit is designed with a spacer-coupling, just remove the spacer. After that the bearing bracket with the entire rotating part can be removed. This means that almost the whole pump can be dismantled without having to detach the suction and delivery piping. The motor remains in its position. If the pump unit does not have a spacer coupling, the motor has to be removed from the foundation before disassembly.

### 7.6.1 Disassembling the guard

1 Loosen bolts (0960). See figure 12.

2 Remove both jackets (0270). See figure 10.

### 7.6.2 Disassembling the Back-Pull-Out unit

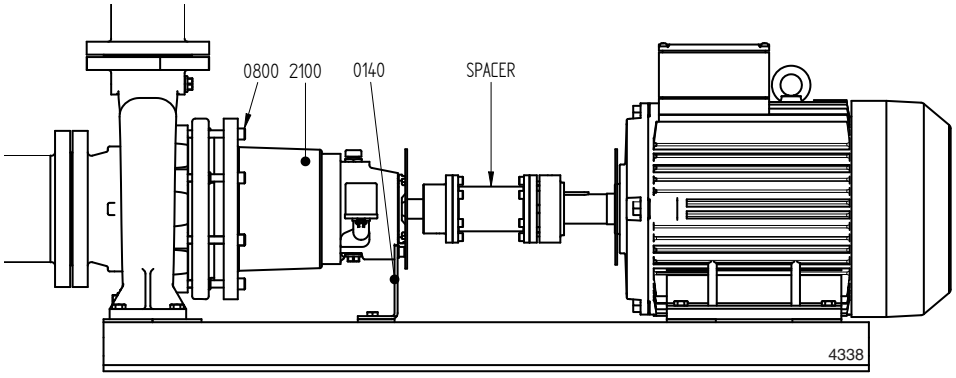


*Figure 9: Back-Pull-Out principle.*

1 Mounted with spacer coupling: Remove the spacer. Else: Remove the electric motor.

2 Disconnect possible liquid lines in case the pump is equipped with jackets.

3 Loosen the bracket support (0140) from the base plate, see figure 9.

4 Remove the Allen screws (0800).

5 Pull the entire bearing bracket (2100) from the pump casing. The entire bearing bracket of large pumps is very heavy. Support it with a beam or hang it in a pulley sling.

6 Remove the coupling half from the pump shaft and remove the coupling key (2210).

7 Unscrew bolts (0940) and remove the assembly plate (0275) from the bearing cover (2110).

### 7.6.3 Assembling the Back-Pull-Out unit

1 Fit a new gasket (0300) into the pump casing and fit the entire bearing bracket back into the pump casing. Tighten the Allen screws (0800) crosswise.

2 Fix the bearing support (0140) on the base plate.

3 If applicable reconnect the liquid lines to the jackets.

4 Fit the assembly plate (0275) to the bearing cover (2110) with bolts (0940).

5 Fit the coupling key (2210) and fit the coupling half onto the pump shaft.

6 Place the motor back in its place or fit the spacer of the spacer coupling.

7 Check the alignment of pump and motor shaft, see paragraph 3.4.3 "Alignment of the coupling". If necessary, realign in operating position.

### 7.7 Assembling the guard

1 Fit the jacket (0270) at motor side. The annular groove must be located at motor side.

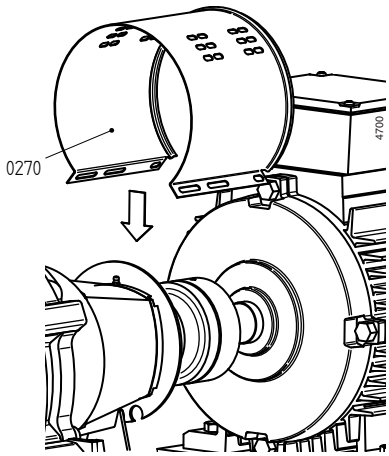


*Figure 10: Fitting the jacket at motor side.*

2 Place the assembly plate (0280) over the motor shaft and fit it into the annular groove of the jacket.

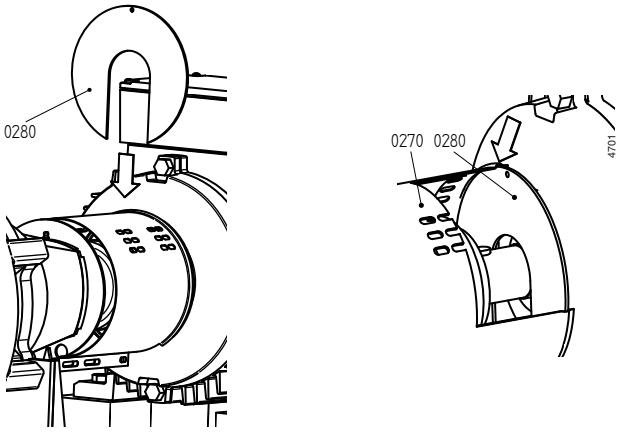


*Figure 11: Fitting the assembly plate at motor side.*

3 Close the jacket and fit bolt (0960). See figure 12.

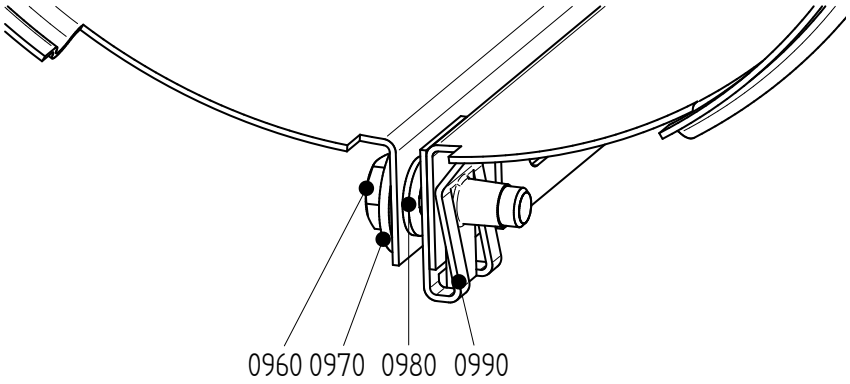


*Figure 12: Fitting jacket.*

4 Mount the jacket (0270) at pump side. Place it over the present jacket at motor side. The annular groove must be located at pump side.

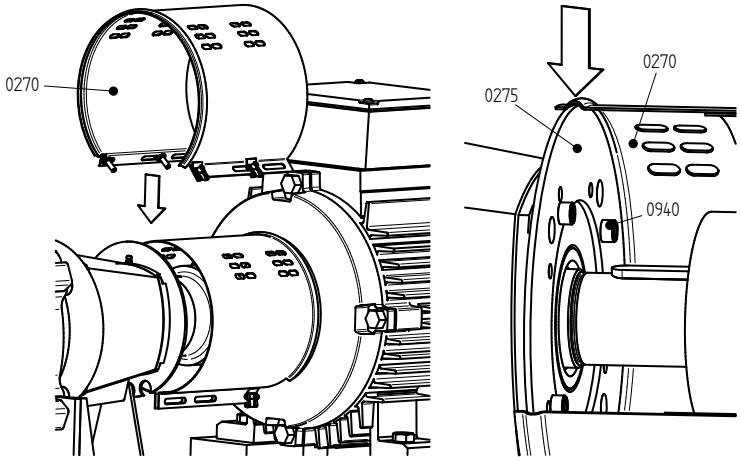


*Figure 13: Fitting the jacket at pump side.*

5 Close the jacket and fit bolt (0960). See figure 12.

6 Slide the jacket at motor side towards the motor as far as possible. Fix both jackets with bolt (0960).

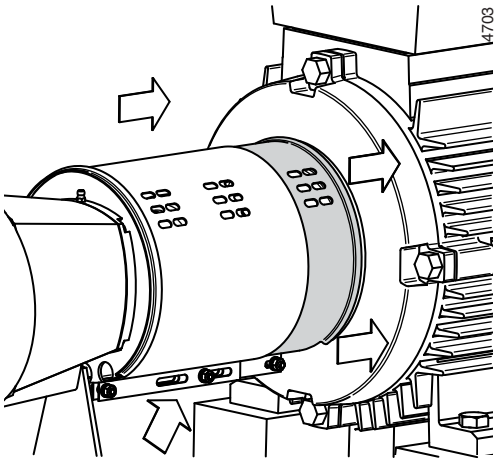


*Figure 14: Adjusting the jacket at motor side.*

## 7.8 Disassembling

### 7.8.1 Disassembly of the Back-Pull-Out unit

If the complete pump has been removed, first the Back-Pull-Out unit must be removed:

1 Place the pump vertically on a work bench, resting on the suction flange.

2 Screw a lifting eye (M10) into the end of the pump shaft and fix a hook or a lifting belt to it.

3 Remove the Allen screws (0800).

4 Lift the Back-Pull-Out unit off the pump casing.

5 Remove the gasket (0300).

### 7.8.2 Disassembly of the impeller

Subsequently the impeller must be removed to remove the inner rotor afterwards.

1 Place the Back-Pull-Out unit horizontally on the work bench.

2 Block the impeller with a screw driver and remove the cap nut (1820). It may be necessary to heat up the nut previously to break the Loctite connection.

3 Remove impeller (0120) using a proper puller (or wriggle the impeller loose by inserting e.g. 2 large screw drivers between the impeller and the intermediate cover (1000).

4 Remove the impeller key (1860).

### 7.8.3 Disassembling the bearing bracket

The bearing bracket with the outer rotor can be removed as follows:

1 Lower the Back-Pull-Out unit to the work bench and let it rest on the intermediate cover. The work bench top must be provided with a hole to place the shaft end into. If this is not present, have the intermediate cover rest on e.g. 2 beams.

2 Remove the Allen screws (0850).

3 Tighten both push bolts (2840) evenly and completely, in this way it will lift the bearing bracket (2100) with the outer rotor off the intermediate cover (1000) with containment can.

4 Once the outer rotor has come off the containment can, lift the complete bearing bracket off the intermediate cover with a hoist.

5 Remove the gasket (0330).

7.8.4 Disassembling the pump shaft with outer rotor

1 *For MAG 75 with bearing bracket 1 and MAG 135 / 165 with bearing bracket 3:* Loosen the bolts (2810) at the back of the bearing bracket and remove them.

2 *For MAG 110 with bearing brackets 1 or 2 and MAG 135/165 with bearing bracket 2:*
Use a long hexagon wrench through the holes in the outer rotor base and loosen the Allen screws (2810), which fix bearing cover (2350) and remove them.
Loosen and remove the Allen screws (2810), which fix the rear bearing cover (2110) as well.

3 Remove the coupling key (2210). Remove the rear bearing cover (2110) and remove the waved spring (2300) and the spacer (2290).

4 Press the pump shaft (2200) out of the bearing bracket in the direction of the impeller side.

5 Remove the outer rotor (1210) by loosening the Allen screws (2815).

6 Loosen the lock nut (2370) and remove the locking washer (2380).

7 Pull the bearings (2240 and 2250) from the pump shaft using a suitable puller.

8 Remove the bearing cover (2350).

9 Remove the gasket (2160).

7.8.5 Disassembling the inner rotor

1 Put the intermediate cover flat down. The work bench top must be provided with a hole to place the shaft end into. If this is not present, have the intermediate cover rest on e.g. 2 beams.

2 Remove Allen screws (1270) and remove the containment can (1320). Remove the gasket (0230).

3 Cover the jaws of the vice with copper or brass sheet to protect the shaft end and place the entire intermediate cover onto the vice and clamp the shaft end at impeller side.

4 MAG 75: Remove nut (1300) and washer (1290).

5 MAG 110/135/165: Remove bolt (1300), washer (1290) and disc spring (1305).

6 Remove Allen screws (1280). Remove the inner rotor (1200).

For all types:

7 Disassemble the axial bearing at motor side (1240). Remove key (1840).

8 Release the shaft end from the vice and place the intermediate cover on one side. Pull the shaft (2450) forward out of the intermediate cover. Remove the shaft sleeve (1220).

9 Put the intermediate cover flat down. Remove Allen screws (1260) and remove the entire plain bearing (1230).

10 Remove the axial bearing at pump side (1250).

## 7.9 Wear ring

The play between the impeller and the wear ring is 0,3 mm to the diameter at delivery. In case the play has increased to 0,5-0,7 mm due to wear, the impeller and the wear ring should be replaced.

### 7.9.1 Disassembling the wear ring

After removing the Back-Pull-Out unit (see paragraph 7.6.2 "Disassembling the Back-Pull-Out unit") the wear ring can be removed. In most cases the ring has been fixed so tightly that it cannot be removed undamaged.

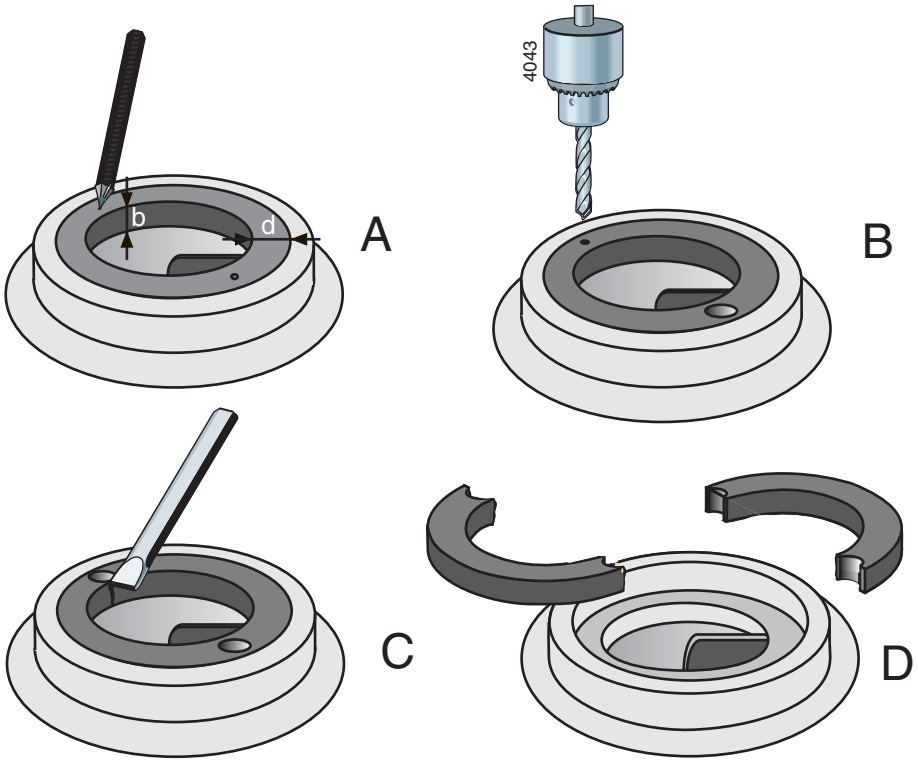


*Figure 15: Removal of wear ring.*

1 Measure the thickness (d) and the width (b) of the ring, see figure 15 A.

2 Make a centre hole in the middle of the edge of the ring at two opposite points, see figure 15 B.

3 Use a drill with a diameter just a little bit smaller than the thickness (d) of the ring and drill two holes in the ring, see figure 15 C. Don't drill deeper than the width (b) of the ring. Take care not to damage the fitting edge of the pump casing.

4 Use a chisel to cut the remaining part of the ring thickness. Now you can remove the ring in two parts from the pump casing, see figure 15 D.

5 Clean the pump casing and carefully remove all bore dust and metal splinters.

### 7.9.2 Assembling the wear ring

1 Clean and degrease the fitting edge of the pump casing where the wear ring is to be mounted.

2 Degrease the outer edge of the wear ring and put a few drops of Loctite 641 on it.

3 Fit the wear ring in the pump casing. **Take care it is not pushed out of alignment!**

## 7.10 Reassembly

7.10.1 Reassembling the pump shaft and the outer rotor

1 Fasten the outer rotor (1210) to the pump shaft (2200) with Allen screws (2815).

2 Mount the oil catcher (2120) in bearing cover (2110) and for execution L3 also the oil catcher (2150) in bearing cover (2350).

3 Place the bearing cover (2350) over the pump shaft (2200).

4 Bond the gasket (2160) to the bearing cover using a little grease.

5 Heat both bearings (2240 and 2250) to around 60 °C.

6 Mount ball bearing (2240), spacer (2280) and ball bearing (2250), in that order, onto the shaft and press the whole assembly firmly against the shaft shoulder. Let the bearings cool down.

**! When reassembling bearings, always use a NEW locking washer (2380)!**

7 Mount the locking washer (2380) and the lock nut (2370). Tighten the lock nut and lock it by bending a tab of the locking washer into the aperture of the lock nut.

8 Slightly grease the outer rings of the ball bearings and mount the complete pump shaft from the impeller side into the bearing bracket (2100).

9 Mount the waved ring (2300), the spacer (2290) and the rear bearing cover (2110).

10 *For all MAG 75* and for *MAG 135 / 165 with bearing bracket 3:*
Insert the bolts (2810) into the holes of the rear bearing cover (2110). Use a screwdriver through the holes in the outer rotor base and position the internal bearing cover (2350) to make the threaded holes correspond with the bolt studs, then screw down the bolts (2810). Tighten all bolts with the appropriate torque, see paragraph 10.5 "Tightening moments".

11 *For all MAG 110* and for *MAG 135 / 165 with bearing bracket 2:*
Use a long hexagon wrench through the holes in the outer rotor base and fix the internal bearing cover (2350) with Allen screws (2810).
Fix rear bearing cover (2110) as well with Allen screws (2810). Tighten all Allen screws with the appropriate torque, see paragraph 10.5 "Tightening moments".

12 Mount the coupling key (2210).

13 Check whether the pump shaft rotates freely and constantly.

### 7.10.2 Reassembly of the inner rotor and the impeller

! **Always use new gaskets for every assembly!**

1 Fit the impeller key (1860) into the key way at the impeller side of the impeller shaft (2450).

2 Fit the impeller (0120) onto the impeller shaft. Apply a few drops of Loctite 243 on the thread and fit the cap nut (1820). Tighten the cap nut with the correct torque, see paragraph 10.5 "Tightening moments".

3 Fit the carrier pin (1310) into the impeller shaft.

4 Put the impeller flat down, the shaft end pointing upwards.

5 Place 0,5 mm shims on the back vanes of the impeller. Place the intermediate cover (1000) over the impeller and the impeller shaft.

6 Fit the axial bearing at pump side (1250) onto the impeller shaft. Ensure the slot in the axial bearing corresponds with the carrier pin (1310)!

7 Fit the shaft sleeve (1220) onto the impeller shaft.

8 Fit the plain bearing (1230) onto the shaft sleeve on the intermediate cover and fit the Allen screws (1260). Tighten them crossways.

MAG 75:

9 Fit the axial bearing at motor side (1240) onto the impeller shaft.

10 Fit the key (1840).

11 Fit the inner rotor (1200) to the axial bearing (1240) with Allen screws (1280). Tighten them crossways with the appropriate torque, see paragraph 10.5 "Tightening moments".

12 Fit the washer (1290), apply a few drops of Loctite 243 to the thread and fit the nut (1300). Tighten it with the appropriate torque, see paragraph 10.5 "Tightening moments".

MAG 110/135/165:

13 Fit the key (1840).

14 Fit the axial bearing at motor side (1240) onto the pump shaft.

15 Fit the inner rotor (1200) to the axial bearing (1240) with Allen screws (1280). Tighten them crossways with the appropriate torque, see paragraph 10.5 "Tightening moments".

16 Fit the disc spring (1305) and the washer (1290), apply a few drops of Loctite 243 to the thread and fit the bolt (1300). Tighten it with the appropriate torque, see paragraph 10.5 "Tightening moments".

All:

17 Fit a **new** gasket (0230) and place the containment can (1320) onto the intermediate cover. Fit the Allen screws (1270) and tighten them crossways with the appropriate torque, see paragraph 10.5 "Tightening moments".

! **Be careful not to damage the containment can!**

18 Remove the shims from between the impeller and the intermediate cover.

7.10.3 Mounting the bearing bracket to the intermediate cover

1 Let the assembly rest on the impeller, with the containment can upwards.

2 Place a new gasket (0330).

3 Ensure the push bolts (2840) are both completely screwed in the flange of the bearing bracket.

4 Screw a lifting eye (M10) into the end of the pump shaft and fix a hook or a lifting belt to it.

5 Lift the complete bearing bracket with a hoist and lower it to the intermediate cover assembly.

6 Centre the bearing bracket carefully over the containment can. **Be careful not to damage the containment can with the outer rotor!**

⚠ ***Ensure no body parts or any objects are placed between the intermediate stage and the bearing bracket. The magnetic forces are very strong and act quite suddenly!***

7 Evenly loosen the push bolts (2840) and carefully lower the bearing bracket until the bearing bracket rests completely on the intermediate cover.

8 Fasten the bearing bracket with Allen screws (0850). Tighten them crossways with the correct torque setting, see paragraph 10.5 "Tightening moments".

9 Check if the pump shaft rotates freely and evenly. Only then should the pump be placed horizontally.

7.10.4 Inspection after reassembly

- Check, in case back vanes are present, the axial play behind the impeller. The minimum gap is 0,2 mm.
- Check the axial play of the bearing, this is 0,25 ±0,1 mm.
- Check if the impeller runs smoothly and evenly.

7.10.5 Mounting the Back-Pull-Out unit to the pump casing

1 Put the pump casing (0100) flat down, resting on the suction flange.

2 Place a **new** gasket (0300) into the rim of the pump casing.

3 Lower the Back-Pull-Out unit into the pump casing. Fit Allen screws (0800) and tighten them crossways with the prescribed torque, see paragraph 10.5 "Tightening moments".

## 7.11 Checking for leakage

! **Once the entire pump unit is assembled, check it for leakage. Pressurize the pump with water at a pression of 1,5x the maximum working pressure. See paragraph 10.1 "Maximum allowable working pressures" for the appropriate pressures.**

# 8 Dimensions

## 8.1 Base plate dimensions and weights

| Base plate number | [mm] | | | | | | | | | Weight [kg] |
|---|---|---|---|---|---|---|---|---|---|---|
| | L | B | fa | fb | fc | fd | fe | ff | fh | |
| **1** | 800 | 305 | 19 | 6 | 385 | 433 | 120 | 560 | 45 | 20 |
| **2** | 1000 | 335 | 19 | 8 | 425 | 473 | 145 | 710 | 63 | 38 |
| **3** | 1250 | 375 | 24 | 10 | 485 | 545 | 175 | 900 | 80 | 69 |
| **4** | 1250 | 500 | 24 | 10 | 610 | 678 | 175 | 900 | 90 | 79 |
| **5** | 1600 | 480 | 24 | 10 | 590 | 658 | 240 | 1120 | 100 | 107 |
| **6** | 1650 | 600 | 24 | 10 | 720 | 788 | 240 | 1170 | 130 | 129 |

## 8.2 Connections

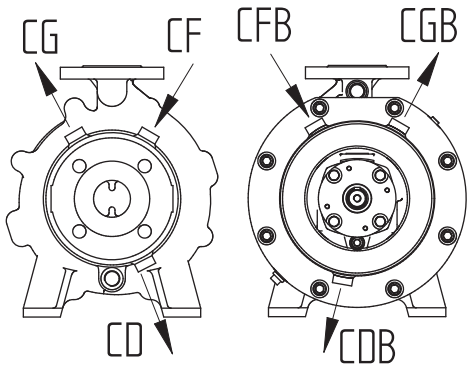


*Figure 16: Connections for pump casing jacket and bearing bracket jacket.*

*Table 5: Connections to the pump casing jacket and bearing bracket jacket.*

| | | |
|---|---|---|
| CF | Pump casing jacket inlet | ½ NPT |
| CFB | Bearing bracket jacket inlet | ½ NPT |
| CG | Pump casing jacket outlet | ½ NPT |
| CGB | Bearing bracket jacket outlet | ½ NPT |
| CD | Pump casing jacket drain | ½ NPT |
| CDB | Bearing bracket jacket drain | ½ NPT |

*Table 6: Connections to the pump.*

| | | |
|---|---|---|
| BM | Oil drain | G ½ |
| BO | Oil sight glass | G ¾ |
| BP | Pump casing drain | G ½ |
| BS | Intermediate cover drain | G ¼ |
| BU | PT100 connection | M8x1 |
| BV | Oil filling plug | G ½ |
| BW | Constant level oiler | G ¼ |
| BZ | Connection discharge flange | G ½ |

## 8.3 Flange dimensions

See figure 17.

*Table 7: Flange dimensions - cast iron and nodular cast iron G, NG*

| ISO 7005 PN 16 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| aa | ab | ac | ad | ae | af | ag | ah | ai x ak | aj x al | am | an |
| 50 | 32 | 102 | 78 | 125 | 100 | 165 | 140 | 4 x 18 | 4 x 18 | 20 | 18 |
| 65 | 40 | 122 | 88 | 145 | 110 | 185 | 150 | 4 x 18 | 4 x 18 | 20 | 18 |
| 80 | 50 | 138 | 102 | 160 | 125 | 200 | 165 | 8 x 18 | 4 x 18 | 22 | 20 |
| 100 | 65 | 158 | 122 | 180 | 145 | 220 | 185 | 8 x 18 | 4 x 18 | 24 | 20 |
| 125 | 80 | 188 | 138 | 210 | 160 | 250 | 200 | 8 x 18 | 8 x 18 | 26 | 22 |
| 125 | 100 | 188 | 158 | 210 | 180 | 250 | 220 | 8 x 18 | 8 x 18 | 26 | 24 |
| 150 | 125 | 212 | 188 | 240 | 210 | 285 | 250 | 8 x 22 | 8 x 18 | 26 | 26 |

*Table 8: Flange dimensions - stainless steel R*

| ISO 7005 PN 16 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| aa | ab | ac | ad | ae | af | ag | ah | ai x ak | aj x al | am | an |
| 50 | 32 | 99 | 76 | 125 | 100 | 165 | 140 | 4 x 18 | 4 x 18 | 22,5 | 20,5 |
| 65 | 40 | 118 | 84 | 145 | 110 | 185 | 150 | 4 x 18 | 4 x 18 | 22,5 | 20,5 |
| 80 | 50 | 132 | 99 | 160 | 125 | 200 | 165 | 8 x 18 | 4 x 18 | 22,5 | 22,5 |
| 100 | 65 | 156 | 118 | 180 | 145 | 230 | 185 | 8 x 18 | 4 x 18 | 26,5 | 22,5 |
| 125 | 80 | 184 | 132 | 210 | 160 | 255 | 200 | 8 x 18 | 8 x 18 | 26,7 | 23,1 |
| 125 | 100 | 184 | 156 | 210 | 180 | 255 | 230 | 8 x 18 | 8 x 18 | 26,5 | 26,9 |
| 150 | 125 | 216 | 186 | 240 | 210 | 285 | 255 | 8 x 22 | 8 x 18 | 28 | 27,1 |
| 200 | 150 | 270 | 216 | 295 | 240 | 345 | 285 | 12 x 22 | 8 x 22 | 32,5 | 32,5 |

*Table 9: Flange dimensions - stainless steel R - ISO 7005 PN20*

| ISO 7005 PN20 (ASME B16.5 150 lbs RF) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| aa | ab | ac | ad | ae | af | ag | ah | ai x ak | aj x al | am | an |
| 50 | 32 | 92 | 63,5 | 120,5 | 89 | 165 | 140 | 4 x 18 | 4 x 16 | 22,5 | 20,5 |
| 65 | 40 | 105 | 73 | 139,5 | 98,5 | 185 | 150 | 4 x 18 | 4 x 16 | 22,5 | 20,5 |
| 80 | 50 | 127 | 92 | 152,5 | 120,5 | 200 | 165 | 4 x 18 | 4 x 18 | 22,5 | 22,5 |
| 100 | 65 | 157,5 | 105 | 190,5 | 139,5 | 230 | 185 | 8 x 18 | 4 x 18 | 26,5 | 22,5 |
| 125 | 80 | 186 | 127 | 216 | 152,5 | 255 | 200 | 8 x 22 | 4 x 18 | 26,7 | 23,1 |
| 125 | 100 | 184 | 156 | 216 | 190,5 | 255 | 230 | 8 x 22 | 8 x 18 | 26,5 | 26,9 |
| 150 | 125 | 216 | 186 | 241,5 | 216 | 285 | 255 | 8 x 22 | 8 x 22 | 28 | 27,1 |
| 200 | 150 | 270 | 216 | 298,5 | 241,5 | 345 | 285 | 8 x 22 | 8 x 22 | 32,5 | 32,5 |

## 8.4 Pump dimensions

### 8.4.1 Dimensions print

| | | |
|---|---|---|
| Cast iron | G | ISO 7005 PN16 |
| Nodular cast iron | NG | ISO 7005 PN16 |
| Stainless steel | R6/R6A | ISO 7005 PN16 |
| Stainless steel | R6/R6A | ISO 7005 PN20 (ASME B16.5 150 lbs) |

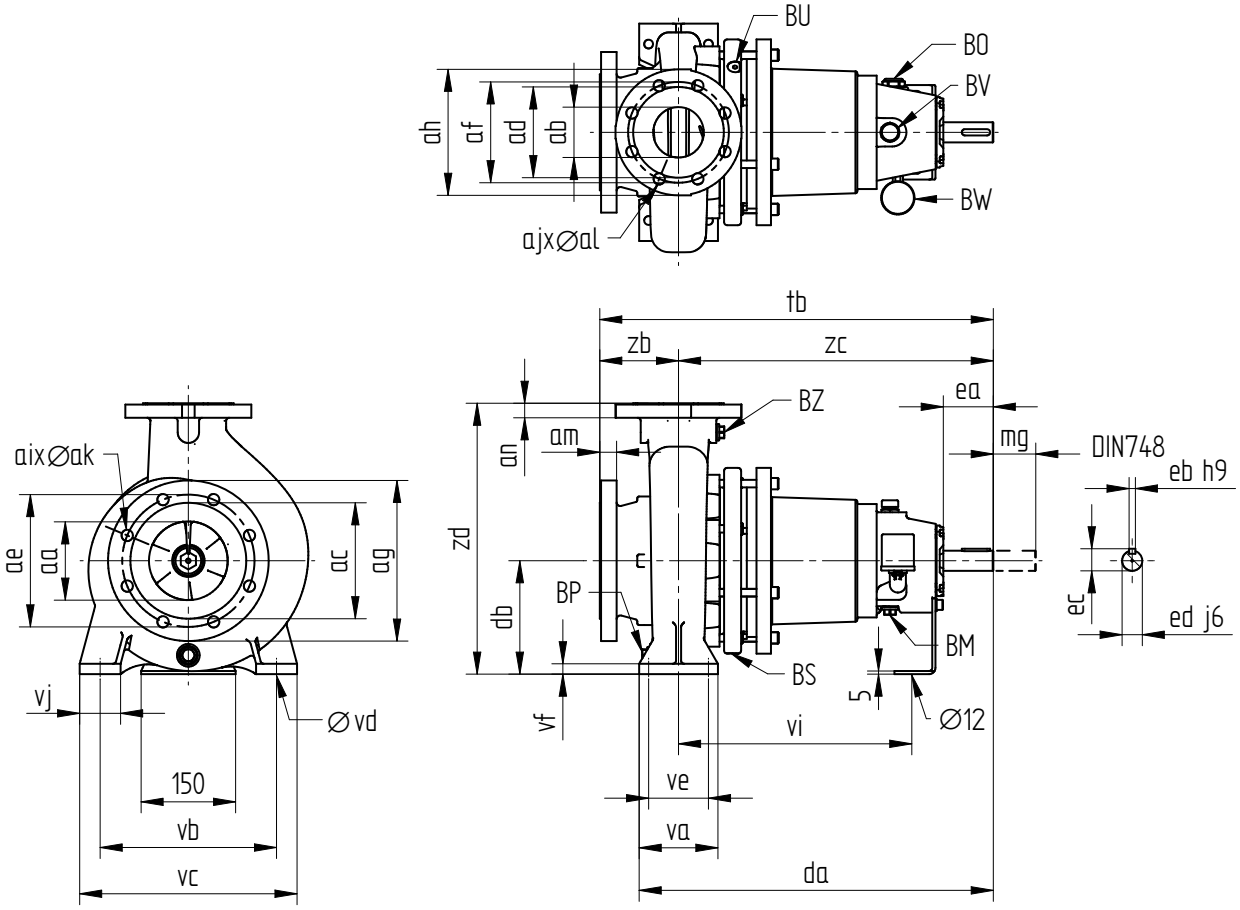


*Figure 17: Pump dimensions.*

8.4.2 Pump dimensions

| CM | aa | ab | da | db | ea | eb | ec | ed | mg | tb | va | vb | vc | vd | ve | vf* | vf** | vi | vj | zb | zc | zd |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32-125 | 50 | 32 | 435 | 112 | 50 | 8 | 27 | 24 | 100 | 465 | 100 | 140 | 190 | 14 | 70 | 10 | 14 | 268 | 50 | 80 | 385 | 252 |
| 32C-125 | | | 435 | 112 | 50 | 8 | 27 | 24 | 100 | 465 | 100 | 140 | 190 | 14 | 70 | 10 | 14 | 268 | 50 | 80 | 385 | 252 |
| 32-160 | | | 435 | 132 | 50 | 8 | 27 | 24 | 100 | 465 | 100 | 190 | 240 | 14 | 70 | 12 | 14 | 268 | 50 | 80 | 385 | 292 |
| 32A-160 | | | 435 | 132 | 50 | 8 | 27 | 24 | 100 | 465 | 100 | 190 | 240 | 14 | 70 | 12 | 14 | 268 | 50 | 80 | 385 | 292 |
| 32C-160 | | | 435 | 132 | 50 | 8 | 27 | 24 | 100 | 465 | 100 | 190 | 240 | 14 | 70 | 12 | 14 | 268 | 50 | 80 | 385 | 292 |
| 32-200 | | | 435 | 160 | 50 | 8 | 27 | 24 | 100 | 465 | 100 | 190 | 240 | 14 | 70 | 12 | 14 | 268 | 50 | 80 | 385 | 340 |
| 32C-200 | | | 435 | 160 | 50 | 8 | 27 | 24 | 100 | 465 | 100 | 190 | 240 | 14 | 70 | 12 | 14 | 268 | 50 | 80 | 385 | 340 |
| 32-250 | | | 563 | 180 | 80 | 10 | 35 | 32 | 100 | 600 | 125 | 250 | 320 | 14 | 95 | 14 | 16 | 346 | 65 | 100 | 500 | 405 |
| 40C-125 | 65 | 40 | 435 | 112 | 50 | 8 | 27 | 24 | 100 | 465 | 100 | 160 | 210 | 14 | 70 | 10 | 14 | 268 | 50 | 80 | 385 | 252 |
| 40C-160 | | | 435 | 132 | 50 | 8 | 27 | 24 | 100 | 465 | 100 | 190 | 240 | 14 | 70 | 12 | 14 | 268 | 50 | 80 | 385 | 292 |
| 40C-200 | | | 435 | 160 | 50 | 8 | 27 | 24 | 100 | 485 | 100 | 212 | 265 | 14 | 70 | 12 | 14 | 268 | 50 | 100 | 385 | 340 |
| 40-250 | | | 563 | 180 | 80 | 10 | 35 | 32 | 100 | 600 | 125 | 250 | 320 | 14 | 95 | 14 | 16 | 346 | 65 | 100 | 500 | 405 |
| 40A-315 | | | 563 | 200 | 80 | 10 | 35 | 32 | 100 | 625 | 125 | 280 | 345 | 14 | 95 | 14 | 14 | 346 | 65 | 125 | 500 | 450 |
| 50C-125 | 80 | 50 | 435 | 132 | 50 | 8 | 27 | 24 | 100 | 485 | 100 | 190 | 240 | 14 | 70 | 10 | 12 | 268 | 50 | 100 | 385 | 292 |
| 50C-160 | | | 435 | 160 | 50 | 8 | 27 | 24 | 100 | 485 | 100 | 212 | 265 | 14 | 70 | 12 | 14 | 268 | 50 | 100 | 385 | 340 |
| 50C-200 | | | 435 | 160 | 50 | 8 | 27 | 24 | 100 | 485 | 100 | 212 | 265 | 14 | 70 | 12 | 14 | 268 | 50 | 100 | 385 | 360 |
| 50-250 | | | 563 | 180 | 80 | 10 | 35 | 32 | 100 | 625 | 125 | 250 | 320 | 14 | 95 | 14 | 16 | 346 | 65 | 125 | 500 | 405 |
| 50-315 | | | 563 | 225 | 80 | 10 | 35 | 32 | 100 | 625 | 125 | 280 | 345 | 14 | 95 | 15 | 15 | 346 | 65 | 125 | 500 | 505 |
| 65C-125 | 100 | 65 | 448 | 160 | 50 | 8 | 27 | 24 | 100 | 485 | 125 | 212 | 280 | 14 | 95 | 10 | 15 | 268 | 65 | 100 | 385 | 340 |
| 65C-160 | | | 563 | 160 | 80 | 10 | 35 | 32 | 100 | 600 | 125 | 212 | 280 | 14 | 95 | 12 | 14 | 346 | 65 | 100 | 500 | 360 |
| 65C-200 | | | 563 | 180 | 80 | 10 | 35 | 32 | 140 | 600 | 125 | 250 | 320 | 14 | 95 | 14 | 16 | 346 | 65 | 100 | 500 | 405 |
| 65A-250 | | | 580 | 200 | 80 | 10 | 35 | 32 | 140 | 625 | 160 | 280 | 360 | 18 | 120 | 14 | 16 | 346 | 80 | 125 | 500 | 450 |
| 65-315 | | | 610 | 225 | 100 | 12 | 45 | 42 | 140 | 655 | 160 | 315 | 400 | 18 | 120 | 16 | 16 | 368 | 80 | 125 | 530 | 505 |
| 80C-160 | 125 | 80 | 563 | 180 | 80 | 10 | 35 | 32 | 140 | 625 | 125 | 250 | 320 | 14 | 95 | 14 | 16 | 346 | 65 | 125 | 500 | 405 |
| 80C-200 | | | 563 | 180 | 80 | 10 | 35 | 32 | 140 | 625 | 125 | 280 | 345 | 14 | 95 | 14 | 16 | 346 | 65 | 125 | 500 | 430 |
| 80-250 | | | 580 | 225 | 80 | 10 | 35 | 32 | 140 | 625 | 160 | 315 | 400 | 18 | 120 | 15 | 18 | 346 | 80 | 125 | 500 | 505 |
| 80A-250 | | | 580 | 225 | 80 | 10 | 35 | 32 | 140 | 625 | 160 | 315 | 400 | 18 | 120 | 15 | 18 | 346 | 80 | 125 | 500 | 505 |
| 80-315 | | | 610 | 250 | 110 | 12 | 45 | 42 | 140 | 655 | 160 | 315 | 400 | 18 | 120 | 16 | 16 | 368 | 80 | 125 | 530 | 565 |
| 80-400 | | | 610 | 280 | 110 | 12 | 45 | 42 | 140 | 655 | 160 | 355 | 435 | 18 | 120 | 18 | 18 | 368 | 80 | 125 | 530 | 635 |
| 100C-200 | 125 | 100 | 580 | 200 | 80 | 10 | 35 | 32 | 140 | 625 | 160 | 280 | 360 | 18 | 120 | 15 | 15 | 346 | 80 | 125 | 500 | 480 |
| 100C-250 | | | 610 | 225 | 110 | 12 | 45 | 42 | 140 | 670 | 160 | 315 | 400 | 18 | 120 | 16 | 16 | 368 | 80 | 140 | 530 | 505 |
| 100-315 | | | 610 | 250 | 110 | 12 | 45 | 42 | 140 | 670 | 160 | 315 | 400 | 18 | 120 | 18 | 18 | 368 | 80 | 140 | 530 | 565 |
| 100-400 | | | 630 | 280 | 110 | 12 | 45 | 42 | 140 | 670 | 200 | 400 | 500 | 22 | 180 | 20 | 20 | 368 | 100 | 140 | 530 | 635 |
| 125-250 | 150 | 125 | 610 | 250 | 110 | 12 | 45 | 42 | 140 | 670 | 160 | 315 | 400 | 18 | 120 | 28 | 28 | 368 | 80 | 140 | 530 | 605 |
| 125-315 | | | 630 | 280 | 110 | 12 | 45 | 42 | 140 | 670 | 200 | 400 | 500 | 22 | 150 | 20 | 20 | 368 | 100 | 140 | 530 | 635 |
| 125-400 | | | 630 | 315 | 110 | 12 | 45 | 42 | 140 | 670 | 200 | 400 | 500 | 22 | 150 | 20 | 20 | 368 | 100 | 140 | 530 | 715 |
| 150-400 | 200 | 150 | 630 | 315 | 110 | 12 | 45 | 42 | 140 | 690 | 200 | 450 | 550 | 23 | 150 | 22 | 22 | 368 | 160 | 160 | 530 | 765 |

* cast iron and nodular cast iron

** stainless steel and stainless steel ISO 7005 PN10/PN20 (ASME B16.5 150 lbs)

## 8.5 Pump-motor unit with standard coupling

### 8.5.1 Dimensions print

| | | |
|---|---|---|
| Cast iron | G | ISO 7005 PN16 |
| Nodular cast iron | NG | ISO 7005 PN16 |
| Stainless steel | R6/R6A | ISO 7005 PN16 |
| Stainless steel | R6/R6A | ISO 7005 PN20 (ASME B16.5 150 lbs) |

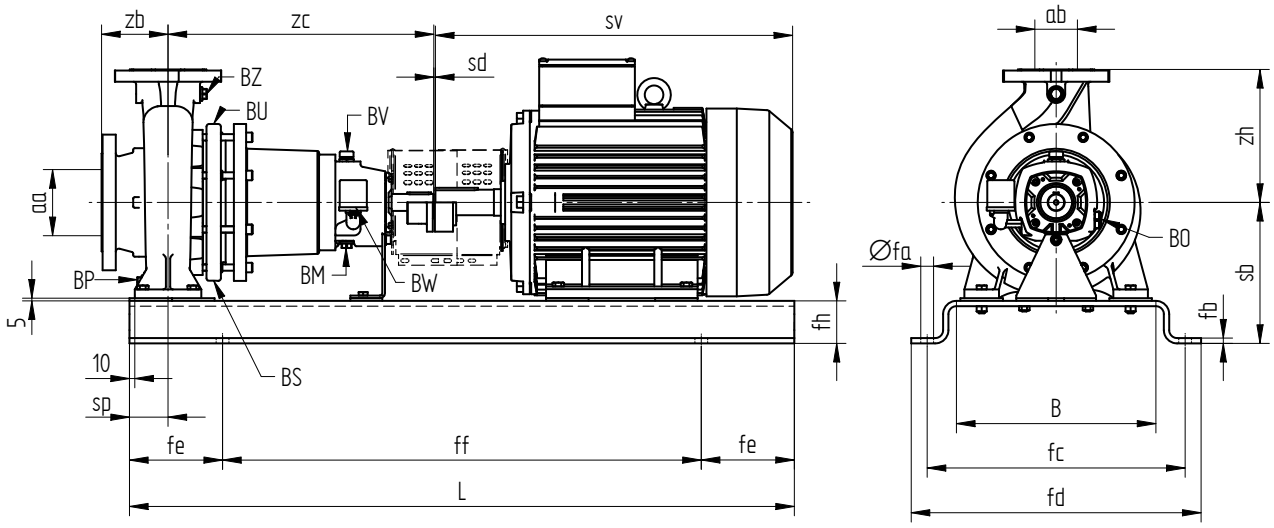


*Figure 18: Pump-motor unit with standard coupling*

### 8.5.2 Dimensions

| Type CM | ISO 7005 PN16 PN20 | | | | | | | IEC Motor IP55 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 80 | 90 S | 90 L | 100 L | 112 M | 132 S | 132 M | 160 M | 160 L | 180 M | 180 L | 200 L | 225 S | 225 M | 250 M | 280 S | 280 M |
| | | | | | | | | sv(*) | | | | | | | | | | | | | | | | |
| | aa | ab | sp | zb | zc | zh | | 296 | 336 | 348 | 402 | 432 | 486 | 520 | 652 | 672 | 712 | 742 | 790 | 904 | 904 | 1014 | 1124 | 1176 |
| 32-125 | 50 | 32 | 60 | 80 | 385 | 140 | sb | 162 | 162 | 162 | 162 | 162 | 200 | | | | | | | | | | | |
| | | | | | | | x | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | |
| 32C-125 | | | 60 | 80 | 385 | 140 | sb | 162 | 162 | 162 | 162 | 162 | 200 | | | | | | | | | | | |
| | | | | | | | x | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | |
| 32-160 | | | 60 | 80 | 385 | 160 | sb | 182 | 182 | 182 | 182 | 182 | 200 | | | | | | | | | | | |
| | | | | | | | x | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | |
| 32A-160 | | | 60 | 80 | 385 | 160 | sb | 182 | 182 | 182 | 182 | 182 | 200 | | | | | | | | | | | |
| | | | | | | | x | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | |
| 32C-160 | | | 60 | 80 | 385 | 160 | sb | 182 | 182 | 182 | 182 | 182 | 200 | | | | | | | | | | | |
| | | | | | | | x | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | |
| 32-200 | | | 60 | 80 | 385 | 180 | sb | 210 | 210 | 210 | 210 | 210 | 228 | | 228 | | | | | | | | | |
| | | | | | | | x | 1 | 1 | 1 | 1 | 1 | 2 | | 2 | | | | | | | | | |
| 32C-200 | | | 60 | 80 | 385 | 180 | sb | 210 | 210 | 210 | 210 | 210 | 228 | | 228 | | | | | | | | | |
| | | | | | | | x | 1 | 1 | 1 | 1 | 1 | 2 | | 2 | | | | | | | | | |
| 32-250 | | | 72 | 100 | 500 | 225 | sb | 248 | 248 | 248 | 248 | 248 | 248 | | 265 | 265 | 265 | | 295 | | | | | |
| | | | | | | | x | 2 | 2 | 2 | 2 | 2 | 2 | | 3 | 3 | 3 | | 4 | | | | | |

| Type CM | ISO 7005 PN16 PN20 | | | | | | | IEC Motor IP55 | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 80 | 90 S | 90 L | 100 L | 112 M | 132 S | 132 M | 160 M | 160 L | 180 M | 180 L | 200 L | 225 S | 225 M | 250 M | 280 S | 280 M |
| | | | | | | | | sv(*) | | | | | | | | | | | | | | | | |
| | aa | ab | sp | zb | zc | zh | | 296 | 336 | 348 | 402 | 432 | 486 | 520 | 652 | 672 | 712 | 742 | 790 | 904 | 904 | 1014 | 1124 | 1176 |
| 40C-125 | 65 | 40 | 60 | 80 | 385 | 140 | sb | 162 | 162 | 162 | 162 | 162 | 200 | | | | | | | | | | | |
| | | | | | | | x | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | |
| 40C-160 | | | 60 | 80 | 385 | 160 | sb | 182 | 182 | 182 | 182 | 182 | 200 | | 228 | | | | | | | | | |
| | | | | | | | x | 1 | 1 | 1 | 1 | 1 | 2 | | 2 | | | | | | | | | |
| 40C-200 | | | 60 | 100 | 385 | 180 | sb | 210 | 210 | 210 | 210 | 210 | 228 | | 228 | | | | | | | | | |
| | | | | | | | x | 1 | 1 | 1 | 1 | 1 | 2 | | 2 | | | | | | | | | |
| 40-250 | | | 72 | 100 | 500 | 225 | sb | 248 | 248 | 248 | 248 | 248 | 248 | | 265 | 265 | 265 | | 295 | | | | | |
| | | | | | | | x | 2 | 2 | 2 | 2 | 2 | 2 | | 3 | 3 | 3 | | 4 | | | | | |
| 40A-315 | | | 72 | 125 | 500 | 250 | sb | | | 285 | 285 | 285 | 285 | 285 | 285 | 285 | 285 | | 295 | | 320 | 385 | 415 | |
| | | | | | | | x | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 4 | | 4 | 6 | 6 | |
| 50C-125 | 80 | 50 | 60 | 100 | 385 | 160 | sb | 182 | 182 | 182 | 182 | 182 | 200 | | 228 | | | | | | | | | |
| | | | | | | | x | 1 | 1 | 1 | 1 | 1 | 2 | | 2 | | | | | | | | | |
| 50C-160 | | | 60 | 100 | 385 | 180 | sb | 210 | 210 | 210 | 210 | 210 | 228 | | 228 | | | | | | | | | |
| | | | | | | | x | 1 | 1 | 1 | 1 | 1 | 2 | | 2 | | | | | | | | | |
| 50C-200 | | | 60 | 100 | 385 | 200 | sb | 210 | 210 | 210 | 210 | 210 | 228 | | 228 | 228 | 265 | | 295 | | | | | |
| | | | | | | | x | 1 | 1 | 1 | 1 | 1 | 2 | | 2 | 2 | 3 | | 4 | | | | | |
| 50-250 | | | 72 | 125 | 500 | 225 | sb | 248 | 248 | 248 | 248 | 248 | 248 | | 265 | 265 | 265 | | 295 | | 320 | | | |
| | | | | | | | x | 2 | 2 | 2 | 2 | 2 | 2 | | 3 | 3 | 3 | | 4 | | 4 | | | |
| 50-315 | | | 72 | 125 | 500 | 280 | sb | | | 310 | 310 | 310 | 310 | 310 | 310 | 310 | 310 | | 320 | | 320 | 385 | 415 | |
| | | | | | | | x | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 4 | | 4 | 6 | 6 | |
| 65C-125 | 100 | 65 | 72 | 100 | 385 | 180 | sb | 210 | 210 | 210 | 210 | 210 | 228 | | 228 | | | | | | | | | |
| | | | | | | | x | 1 | 1 | 1 | 1 | 1 | 2 | | 2 | | | | | | | | | |
| 65C-160 | | | 72 | 100 | 500 | 200 | sb | 228 | 228 | 228 | 228 | 228 | 228 | | 245 | 245 | 265 | | 295 | | | | | |
| | | | | | | | x | 2 | 2 | 2 | 2 | 2 | 2 | | 3 | 3 | 3 | | 4 | | | | | |
| 65C-200 | | | 72 | 100 | 500 | 225 | sb | 248 | 248 | 248 | 248 | 248 | 248 | | 265 | 265 | 265 | | 295 | | | | | |
| | | | | | | | x | 2 | 2 | 2 | 2 | 2 | 2 | | 3 | 3 | 3 | | 4 | | | | | |
| 65A-250 | | | 90 | 125 | 500 | 250 | sb | | 285 | 285 | 285 | 285 | 285 | 285 | 285 | 285 | 285 | 285 | 295 | | | | | |
| | | | | | | | x | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | | | | | |
| 65-315 | | | 90 | 125 | 530 | 280 | sb | | | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | | 320 | | 330 | 385 | 415 | 415 |
| | | | | | | | x | | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | 5 | 6 | 6 | 6 |
| 80C-160 | 125 | 80 | 72 | 125 | 500 | 225 | sb | | 248 | 248 | 248 | 248 | 248 | | 265 | 265 | 265 | | 295 | | | | | |
| | | | | | | | x | | 2 | 2 | 2 | 2 | 2 | | 3 | 3 | 3 | | 4 | | | | | |
| 80C-200 | | | 72 | 125 | 500 | 250 | sb | | 265 | 265 | 265 | 265 | 265 | 265 | 265 | 265 | 265 | | 295 | | 320 | 385 | 415 | |
| | | | | | | | x | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 4 | | 4 | 6 | 6 | |
| 80-250 | | | 90 | 125 | 500 | 280 | sb | | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | | 320 | | 320 | 385 | 415 | |
| | | | | | | | x | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | 4 | 6 | 6 | |
| 80A-250 | | | 90 | 125 | 500 | 280 | sb | | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | | 320 | | 320 | 385 | 415 | |
| | | | | | | | x | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | 4 | 6 | 6 | |
| 80-315 | | | 90 | 125 | 530 | 315 | sb | | | | 345 | 345 | 345 | 345 | 345 | 345 | 345 | 345 | 345 | | 355 | 385 | 415 | 415 |
| | | | | | | | x | | | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 5 | 6 | 6 | 6 |
| 80-400 | | | 90 | 125 | 530 | 355 | sb | | | | | | 375 | 375 | 375 | 375 | 375 | 375 | 375 | 385 | | | | |
| | | | | | | | x | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 5 | | | | |

| Type CM | ISO 7005 PN16 PN20 | | | | | | | IEC Motor IP55 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 80 | 90 S | 90 L | 100 L | 112 M | 132 S | 132 M | 160 M | 160 L | 180 M | 180 L | 200 L | 225 S | 225 M | 250 M | 280 S | 280 M |
| | | | | | | | | sv(*) | | | | | | | | | | | | | | | | |
| | aa | ab | sp | zb | zc | zh | | 296 | 336 | 348 | 402 | 432 | 486 | 520 | 652 | 672 | 712 | 742 | 790 | 904 | 904 | 1014 | 1124 | 1176 |
| 100C-200 | 125 | 100 | 90 | 125 | 500 | 280 | sb | | | | 285 | 285 | 285 | 285 | 285 | 285 | 285 | | 295 | | 320 | 385 | 415 | |
| | | | | | | | x | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 4 | | 4 | 6 | 6 | |
| 100C-250 | | | 90 | 140 | 530 | 280 | sb | | | | 320 | 320 | 320 | 320 | 320 | 320 | 320 | | 320 | | 330 | 385 | 415 | 415 |
| | | | | | | | x | | | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | 5 | 6 | 6 | 6 |
| 100-315 | | | 90 | 140 | 530 | 315 | sb | | | | | 345 | 345 | 345 | 345 | 345 | 345 | 345 | 345 | 355 | 355 | 385 | 415 | 415 |
| | | | | | | | x | | | | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 6 | 6 | 6 |
| 100-400 | | | 110 | 140 | 530 | 355 | sb | | | | | | 375 | 375 | 375 | 375 | 375 | 375 | 375 | 415 | 415 | 415 | | |
| | | | | | | | x | | | | | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 6 | 6 | 6 | | |
| 125-250 | 150 | 125 | 90 | 140 | 530 | 355 | sb | | | | 345 | 345 | 345 | 345 | 345 | 345 | 345 | 345 | 345 | | 355 | 385 | 415 | 415 |
| | | | | | | | x | | | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 5 | 6 | 6 | 6 |
| 125-315 | | | 110 | 140 | 530 | 355 | sb | | | | | | 375 | 375 | 375 | 375 | 375 | 375 | 375 | 415 | 415 | 415 | | |
| | | | | | | | x | | | | | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 6 | 6 | 6 | | |
| 125-400 | | | 110 | 140 | 530 | 400 | sb | | | | | | | 410 | 410 | 410 | 410 | 410 | 410 | 450 | 450 | 450 | 450 | |
| | | | | | | | x | | | | | | | 4 | 4 | 4 | 4 | 4 | 4 | 6 | 6 | 6 | 6 | |
| 150-400 | 200 | 150 | 110 | 160 | 530 | 450 | sb | | | | | | | | | | 445 | 445 | 445 | 445 | 445 | 445 | 445 | 445 |
| | | | | | | | x | | | | | | | | | | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |

x = base plate number

(*): Motor length based on DIN 42673, could be different due to applied motor make.

## 8.6 Pump-motor unit with spacer coupling

### 8.6.1 Dimensions print

| | | |
|---|---|---|
| Cast iron | G | ISO 7005 PN16 |
| Nodular cast iron | NG | ISO 7005 PN16 |
| Stainless steel | R6/R6A | ISO 7005 PN16 |
| Stainless steel | R6/R6A | ISO 7005 PN20 (ASME B16.5 150 lbs) |

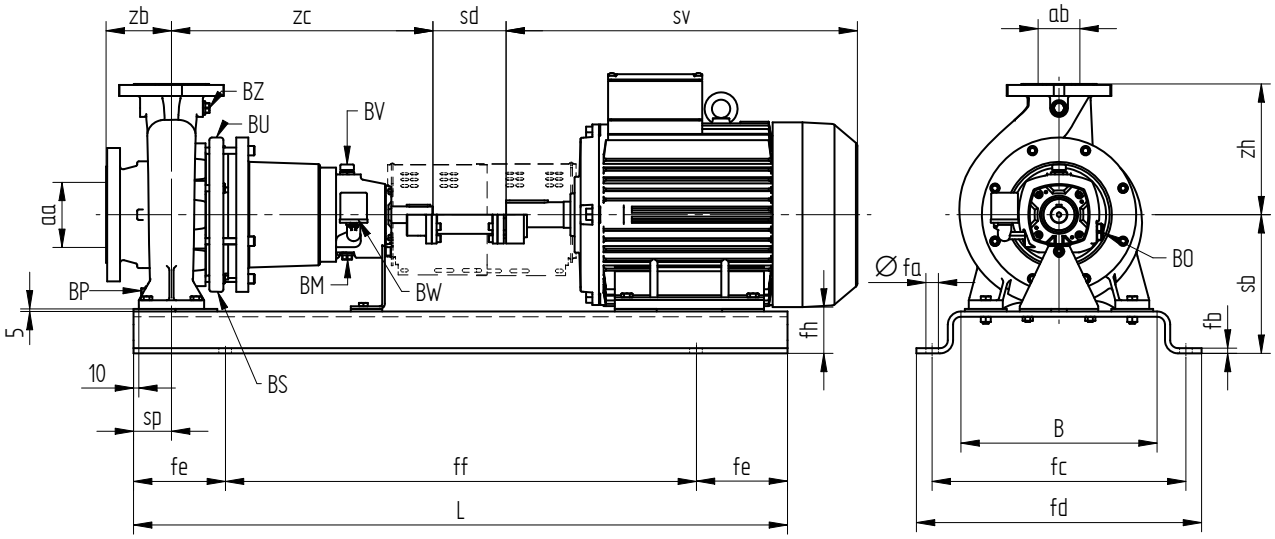


*Figure 19: Pump-motor unit with spacer-coupling.*

### 8.6.2 Dimensions

| Type CM | ISO 7005 PN16 PN20 | | | | | | | | IEC Motor IP55 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 80 | 90 S | 90 L | 100 L | 112 M | 132 S | 132 M | 160 M | 160 L | 180 M | 180 L | 200 L | 225 S | 225 M | 250 M | 280 S | 280 M |
| | | | | | | | | | sv(*) | | | | | | | | | | | | | | | | |
| | aa | ab | sd | sp | zb | zc | zh | | 296 | 336 | 348 | 402 | 432 | 486 | 520 | 652 | 672 | 712 | 742 | 790 | 904 | 904 | 1014 | 1124 | 1176 |
| 32-125 | 50 | 32 | 100 | 60 | 80 | 385 | 140 | sb | 162 | 162 | 180 | 180 | 180 | 180 | | | | | | | | | | | |
| | | | | | | | | x | 1 | 1 | 2 | 2 | 2 | 2 | | | | | | | | | | | |
| 32C-125 | | | 100 | 60 | 80 | 385 | 140 | sb | 162 | 162 | 180 | 180 | 180 | 180 | | | | | | | | | | | |
| | | | | | | | | x | 1 | 1 | 2 | 2 | 2 | 2 | | | | | | | | | | | |
| 32-160 | | | 100 | 60 | 80 | 385 | 160 | sb | 182 | 182 | 200 | 200 | 200 | 200 | | | | | | | | | | | |
| | | | | | | | | x | 1 | 1 | 2 | 2 | 2 | 2 | | | | | | | | | | | |
| 32A-160 | | | 100 | 60 | 80 | 385 | 160 | sb | 182 | 182 | 200 | 200 | 200 | 200 | | | | | | | | | | | |
| | | | | | | | | x | 1 | 1 | 2 | 2 | 2 | 2 | | | | | | | | | | | |
| 32C-160 | | | 100 | 60 | 80 | 385 | 160 | sb | 182 | 182 | 200 | 200 | 200 | 200 | | | | | | | | | | | |
| | | | | | | | | x | 1 | 1 | 2 | 2 | 2 | 2 | | | | | | | | | | | |
| 32-200 | | | 100 | 60 | 80 | 385 | 180 | sb | 210 | 210 | 228 | 228 | 228 | 228 | | 245 | | | | | | | | | |
| | | | | | | | | x | 1 | 1 | 2 | 2 | 2 | 2 | | 3 | | | | | | | | | |
| 32C-200 | | | 100 | 60 | 80 | 385 | 180 | sb | 210 | 210 | 228 | 228 | 228 | 228 | | 245 | | | | | | | | | |
| | | | | | | | | x | 1 | 1 | 2 | 2 | 2 | 2 | | 3 | | | | | | | | | |
| 32-250 | | | 100 | 72 | 100 | 500 | 225 | sb | 248 | 248 | 248 | 248 | 248 | 265 | | 265 | 265 | 265 | | 305 | | | | | |
| | | | | | | | | x | 2 | 2 | 2 | 2 | 2 | 3 | | 3 | 3 | 3 | | 5 | | | | | |

| Type CM | ISO 7005 PN16 PN20 | | | | | | | | IEC Motor IP55 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 80 | 90 S | 90 L | 100 L | 112 M | 132 S | 132 M | 160 M | 160 L | 180 M | 180 L | 200 L | 225 S | 225 M | 250 M | 280 S | 280 M |
| | | | | | | | | | sv(*) | | | | | | | | | | | | | | | | |
| | aa | ab | sd | sp | zb | zc | zh | | 296 | 336 | 348 | 402 | 432 | 486 | 520 | 652 | 672 | 712 | 742 | 790 | 904 | 904 | 1014 | 1124 | 1176 |
| 40C-125 | 65 | 40 | 100 | 60 | 80 | 385 | 140 | sb | 162 | 162 | 180 | 180 | 180 | 180 | | | | | | | | | | | |
| | | | | | | | | x | 1 | 1 | 2 | 2 | 2 | 2 | | | | | | | | | | | |
| 40C-160 | | | 100 | 60 | 80 | 385 | 160 | sb | 182 | 182 | 200 | 200 | 200 | 200 | | 245 | | | | | | | | | |
| | | | | | | | | x | 1 | 1 | 2 | 2 | 2 | 2 | | 3 | | | | | | | | | |
| 40C-200 | | | 100 | 60 | 100 | 385 | 180 | sb | 210 | 210 | 228 | 228 | 228 | 228 | | 245 | | | | | | | | | |
| | | | | | | | | x | 1 | 1 | 2 | 2 | 2 | 2 | | 3 | | | | | | | | | |
| 40-250 | | | 100 | 72 | 100 | 500 | 225 | sb | 248 | 248 | 248 | 248 | 248 | 265 | | 265 | 265 | 265 | | 305 | | | | | |
| | | | | | | | | x | 2 | 2 | 2 | 2 | 2 | 3 | | 3 | 3 | 3 | | 5 | | | | | |
| 40A-315 | | | 100 | 72 | 125 | 500 | 250 | sb | | | 285 | 285 | 285 | 285 | 285 | 285 | 285 | 285 | | 305 | | 330 | 385 | 415 | |
| | | | | | | | | x | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 | | 5 | 6 | 6 | |
| 50C-125 | 80 | 50 | 100 | 60 | 100 | 385 | 160 | sb | 182 | 182 | 200 | 200 | 200 | 200 | | 245 | | | | | | | | | |
| | | | | | | | | x | 1 | 1 | 2 | 2 | 2 | 2 | | 3 | | | | | | | | | |
| 50C-160 | | | 100 | 60 | 100 | 385 | 180 | sb | 210 | 210 | 228 | 228 | 228 | 228 | | 245 | | | | | | | | | |
| | | | | | | | | x | 1 | 1 | 2 | 2 | 2 | 2 | | 3 | | | | | | | | | |
| 50C-200 | | | 100 | 60 | 100 | 385 | 200 | sb | 210 | 210 | 228 | 228 | 228 | 228 | | 245 | 245 | 265 | | 295 | | | | | |
| | | | | | | | | x | 1 | 1 | 2 | 2 | 2 | 2 | | 3 | 3 | 3 | | 4 | | | | | |
| 50-250 | | | 100 | 72 | 125 | 500 | 225 | sb | 248 | 248 | 248 | 248 | 248 | 265 | | 265 | 265 | 265 | | 305 | | 330 | | | |
| | | | | | | | | x | 2 | 2 | 2 | 2 | 2 | 3 | | 3 | 3 | 3 | | 5 | | 5 | | | |
| 50-315 | | | 100 | 72 | 125 | 500 | 280 | sb | | | 310 | 310 | 310 | 310 | 310 | 310 | 310 | 310 | | 330 | | 330 | 385 | 415 | |
| | | | | | | | | x | | | 3 | | 3 | 3 | 3 | 3 | 3 | 3 | | 5 | | 5 | 6 | 6 | |
| 65C-125 | 100 | 65 | 100 | 72 | 100 | 385 | 180 | sb | 210 | 228 | 228 | 228 | 228 | 228 | | 245 | | | | | | | | | |
| | | | | | | | | x | 1 | 2 | 2 | 2 | 2 | 2 | | 3 | | | | | | | | | |
| 65C-160 | | | 100 | 72 | 100 | 500 | 200 | sb | 228 | 228 | 228 | 228 | 228 | 245 | | 245 | 245 | 265 | | 305 | | | | | |
| | | | | | | | | x | 2 | 2 | 2 | 2 | 2 | 3 | | 3 | 3 | 3 | | 5 | | | | | |
| 65C-200 | | | 140 | 72 | 100 | 500 | 225 | sb | 248 | 248 | 248 | 265 | 265 | 265 | | 265 | 265 | 265 | | 305 | | | | | |
| | | | | | | | | x | 2 | 2 | 2 | 3 | 3 | 3 | | 3 | 3 | 3 | | 5 | | | | | |
| 65A-250 | | | 140 | 90 | 125 | 500 | 250 | sb | | 285 | 285 | 285 | 285 | 285 | 285 | 285 | 305 | 305 | 305 | 305 | | 330 | | | |
| | | | | | | | | x | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 5 | 5 | 5 | 5 | | 5 | | | |
| 65-315 | | | 140 | 90 | 125 | 530 | 280 | sb | | | 320 | 320 | 320 | 320 | 320 | 320 | 330 | 330 | | 330 | | 330 | 385 | 415 | 415 |
| | | | | | | | | x | | | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | | 5 | | 5 | 6 | 6 | 6 |
| 80C-160 | 125 | 80 | 140 | 72 | 125 | 500 | 225 | sb | | 248 | 248 | 265 | 265 | 265 | | 265 | 265 | 265 | | 305 | | | | | |
| | | | | | | | | x | | 2 | 2 | 3 | 3 | 3 | | 3 | 3 | 3 | | 5 | | | | | |
| 80C-200 | | | 140 | 72 | 125 | 500 | 250 | sb | | 265 | 265 | 265 | 265 | 265 | 265 | 265 | 265 | 265 | | 305 | | 330 | 385 | 415 | |
| | | | | | | | | x | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 5 | | 5 | 6 | 6 | |
| 80-250 | | | 140 | 90 | 125 | 500 | 280 | sb | | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 330 | | 330 | | 330 | 385 | 415 | |
| | | | | | | | | x | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | | 5 | | 5 | 6 | 6 | |
| 80A-250 | | | 140 | 90 | 125 | 500 | 280 | sb | | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 330 | | 330 | | 330 | 385 | 415 | |
| | | | | | | | | x | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | | 5 | | 5 | 6 | 6 | |
| 80-315 | | | 140 | 90 | 125 | 530 | 315 | sb | | | | 345 | 345 | 345 | 345 | 345 | 355 | 355 | 355 | 355 | | 355 | 385 | 415 | 415 |
| | | | | | | | | x | | | | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | | 5 | 6 | 6 | 6 |
| 80-400 | | | 140 | 90 | 125 | 530 | 355 | sb | | | | | | 375 | 375 | 375 | 385 | 385 | 385 | 385 | 385 | | | | |
| | | | | | | | | x | | | | | | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | | | | |
| 100C-200 | 125 | 100 | 140 | 90 | 125 | 500 | 280 | sb | | | | 285 | 285 | 285 | 285 | 285 | 305 | 305 | | 305 | | 305 | 385 | 415 | |
| | | | | | | | | x | | | | 3 | 3 | 3 | 3 | 3 | 5 | 5 | | 5 | | 5 | 6 | 6 | |
| 100C-250 | | | 140 | 90 | 140 | 530 | 280 | sb | | | | 320 | 320 | 320 | 320 | 320 | 330 | 330 | | 330 | | 330 | 385 | 415 | 415 |
| | | | | | | | | x | | | | 4 | 4 | 4 | 4 | 4 | 5 | 5 | | 5 | | 5 | 6 | 6 | 6 |
| 100-315 | | | 140 | 90 | 140 | 530 | 315 | sb | | | | | 345 | 345 | 345 | 345 | 355 | 355 | 355 | 355 | 355 | 355 | 385 | 415 | 415 |
| | | | | | | | | x | | | | | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 |
| 100-400 | | | 140 | 110 | 140 | 530 | 355 | sb | | | | | | 375 | 375 | 415 | 415 | 415 | 415 | 415 | 415 | 415 | 415 | | |
| | | | | | | | | x | | | | | | 4 | 4 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | | |

| Type CM | ISO 7005 PN16 PN20 | | | | | | | | IEC Motor IP55 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 80 | 90 S | 90 L | 100 L | 112 M | 132 S | 132 M | 160 M | 160 L | 180 M | 180 L | 200 L | 225 S | 225 M | 250 M | 280 S | 280 M |
| | | | | | | | | | sv(*) | | | | | | | | | | | | | | | | |
| | aa | ab | sd | sp | zb | zc | zh | | 296 | 336 | 348 | 402 | 432 | 486 | 520 | 652 | 672 | 712 | 742 | 790 | 904 | 904 | 1014 | 1124 | 1176 |
| 125-250 | 150 | 125 | 140 | 90 | 140 | 530 | 355 | sb | | | | 345 | 345 | 345 | 345 | 345 | 355 | 355 | 355 | 355 | | 355 | 385 | 415 | 415 |
| | | | | | | | | x | | | | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | | 5 | 6 | 6 | 6 |
| 125-315 | | | 140 | 110 | 140 | 530 | 355 | sb | | | | | | 375 | 375 | 415 | 415 | 415 | 415 | 415 | 415 | 415 | 415 | | |
| | | | | | | | | x | | | | | | 4 | 4 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | | |
| 125-400 | | | 140 | 110 | 140 | 530 | 400 | sb | | | | | | | 410 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | |
| | | | | | | | | x | | | | | | | 4 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | |
| 150-400 | 200 | 150 | 140 | 110 | 160 | 530 | 450 | sb | | | | | | | | | | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 |
| | | | | | | | | x | | | | | | | | | | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |

x = base plate number

(*): Motor length based on DIN 42673, could be different due to applied motor make.

# 9 Parts

## 9.1 Ordering parts

### 9.1.1 Order form

You can use the order form included in this manual for ordering parts.

When ordering parts always quote the following data:

1 Your **address**.

2 The **quantity, the item Quantity and the description** of the part.

3 The **pump Quantity**. The pump Quantity is stated on the label on the cover of this manual and on the type plate of the pump.

4 In the event of different electric motor voltage you should state the correct voltage.

### 9.1.2 Recommended spare parts

Parts marked with a * are recommended spare parts.

## 9.2 Pump with MAG 75

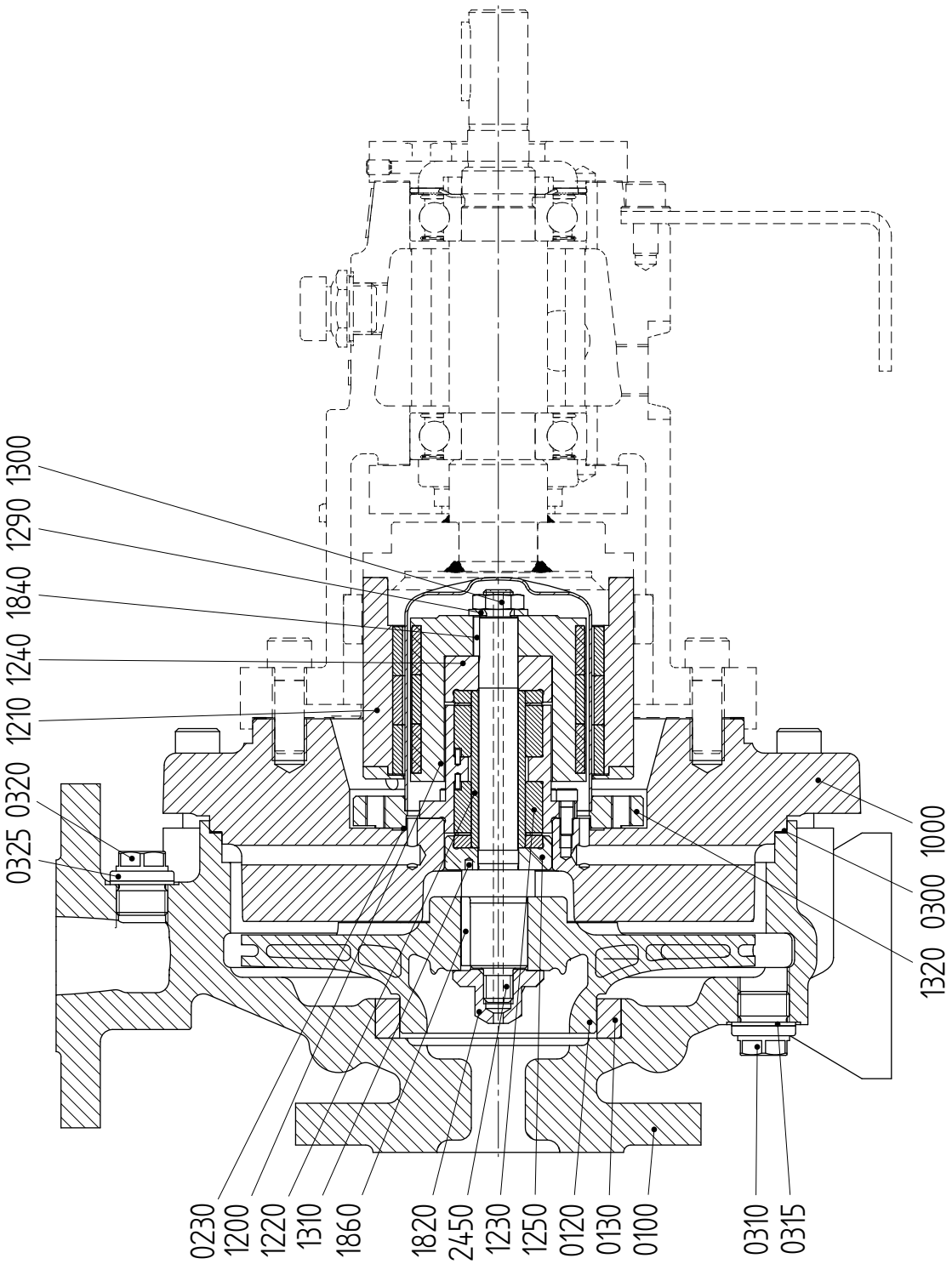


*Figure 20: Sectional drawing pump.*

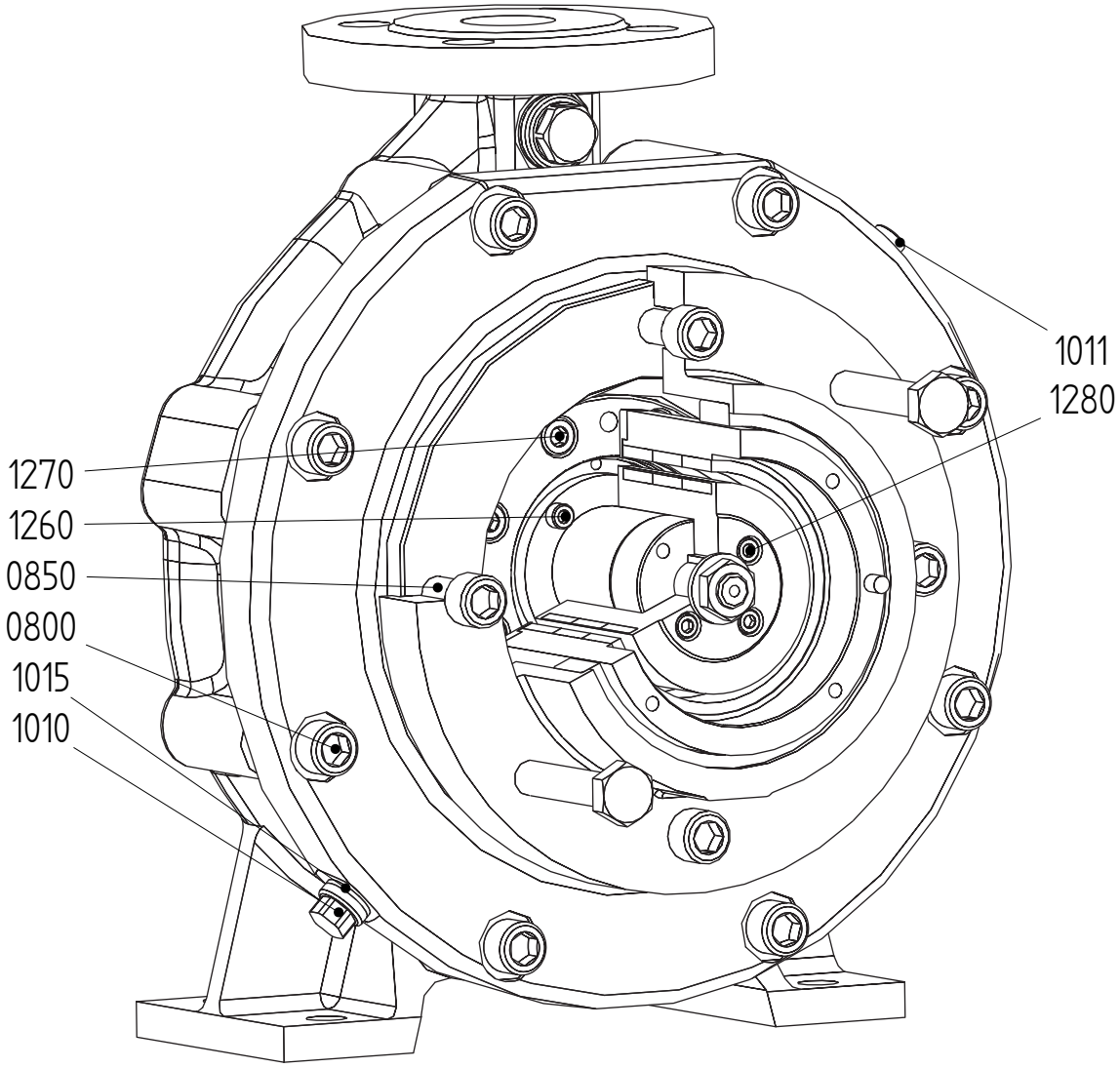


*Figure 21: Magnetic coupling.*

9.2.1 Parts list pump with MAG 75

| Item | Quantity | Description | Materials | | | | |
|---|---|---|---|---|---|---|---|
| | | | G | | NG | | R6 |
| 0100 | 1 | pump casing | cast iron | | nodular c.i. | | st.st. |
| 0120* | 1 | impeller | c.i. | bronze | c.i. | bronze | st.st. |
| 0130* | 1 | wear ring | c.i. | bronze | c.i. | bronze | st.st. |
| 0230* | 1 | gasket | - - | | | | |
| 0300* | 1 | gasket | - - | | | | |
| 0310 | 1 | plug | steel | | | | st.st. |
| 0315 | 1 | sealing ring | copper | | | | gylon |
| 0320 | 1 | plug | steel | | | | st.st. |
| 0325 | 1 | sealing ring | copper | | | | gylon |
| 0800 | 1) | Allen screw | stainless steel | | | | |
| 0850 | 4 | Allen screw | stainless steel | | | | |
| 1000 | 1 | intermediate cover | nodular c.i. | | | | st.st. |
| 1010 | 1 | plug | stainless steel | | | | |
| 1011 | 1 | plug / PT100 | stainless steel / - - | | | | |
| 1015 | 1 | sealing ring | gylon | | | | |
| 1820* | 1 | cap nut | stainless steel | | | | |
| 1840 | 1 | key | stainless steel | | | | |
| 1860* | 1 | key | stainless steel | | | | |
| 2450 | 1 | impeller shaft | stainless steel | | | | |

c.i. = cast iron st.st. = stainless steel

1) Quantity depending on pump type 4 or 8

9.2.2 Parts list complete magnetic coupling MAG 75

| Item | Quantity | Description | Materials |
|---|---|---|---|
| 1200 | 1 | inner rotor | stainless steel |
| 1210 | 1 | outer rotor | steel |
| 1220 | 1 | shaft sleeve | silicon-carbide |
| 1230 | 1 | plain bearing | silicon-carbide / stainless steel |
| 1240 | 1 | axial bearing, motor side | silicon-carbide / stainless steel |
| 1250 | 1 | axial bearing, pump side | silicon-carbide / stainless steel |
| 1260 | 5 | Allen screw | stainless steel |
| 1270 | 8 | Allen screw | stainless steel |
| 1280** | 4 | Allen screw | stainless steel |
| 1290 | 1 | washer | stainless steel |
| 1300 | 1 | nut | stainless steel |
| 1310** | 1 | carrier pin | stainless steel |
| 1320 | 1 | containment can | - - |

** Part of complete delivery

### 9.3 Pump with MAG 110 / MAG 135 / MAG 165

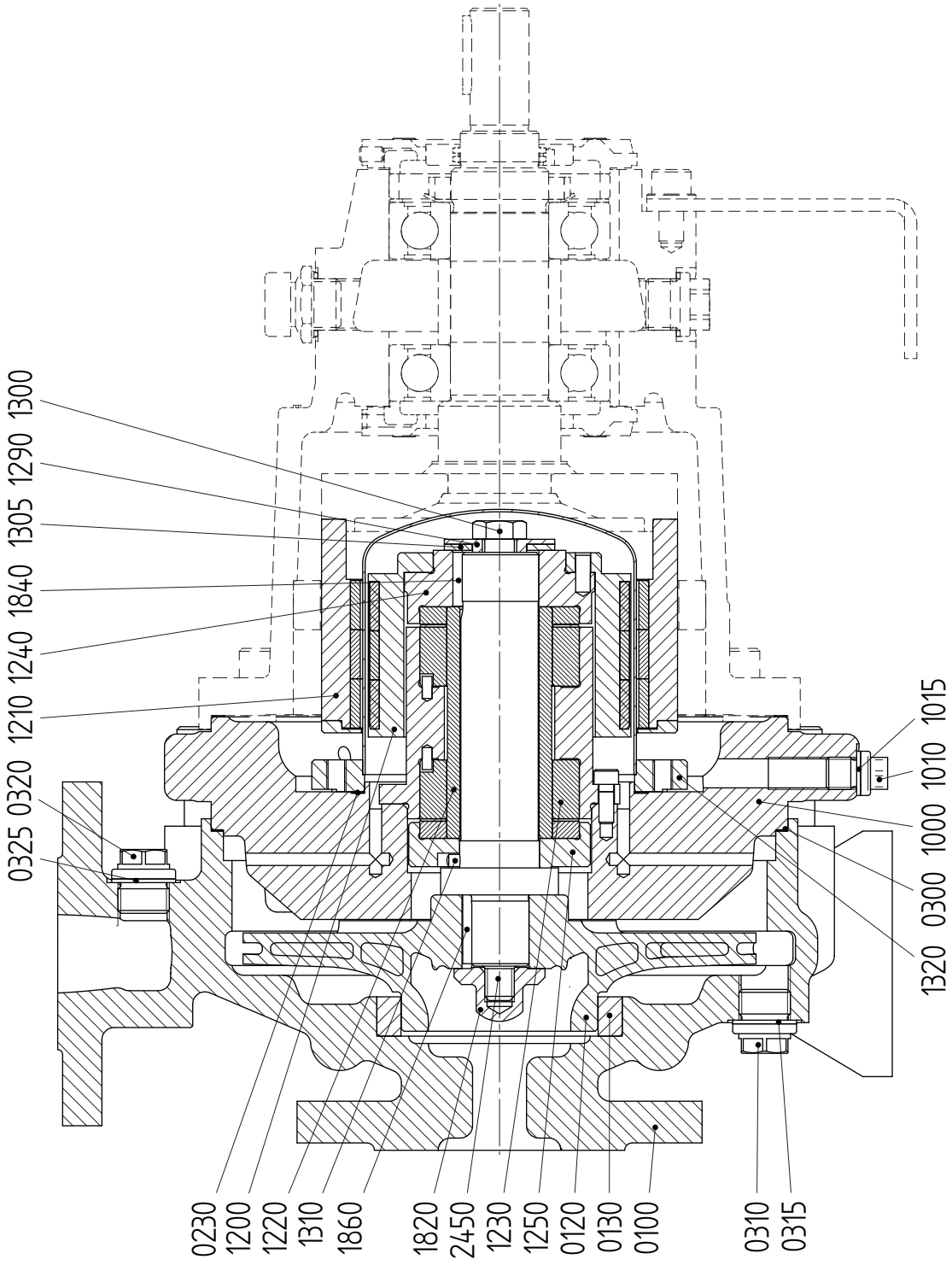


*Figure 22: Sectional drawing pump.*

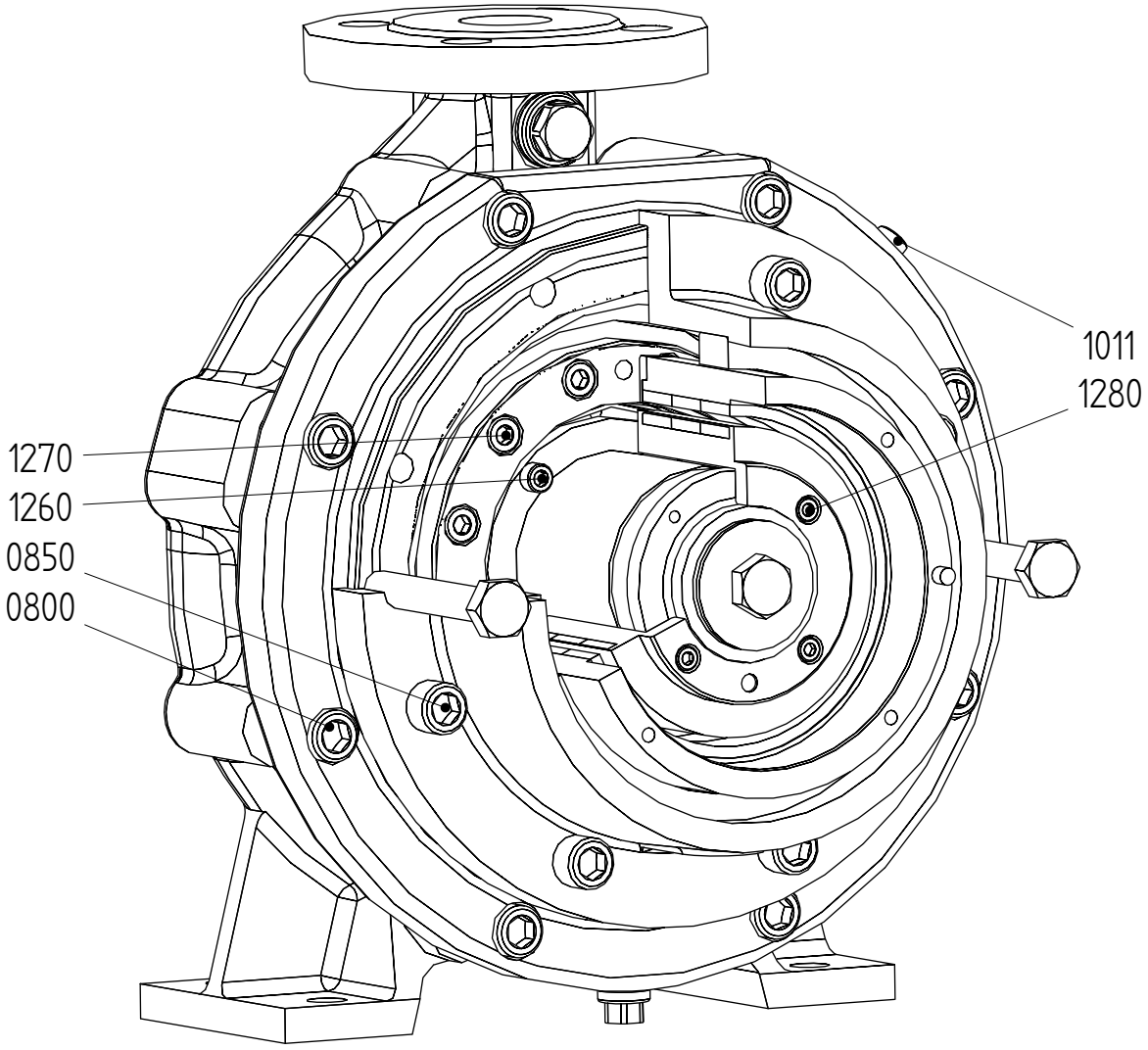


*Figure 23: Magnetic coupling.*

9.3.1 Parts list pump with MAG 110 / MAG 135 / MAG 165

| Item | Quantity | Description | Materials | | | | |
|---|---|---|---|---|---|---|---|
| | | | G | | NG | | R6 |
| 0100 | 1 | pump casing | cast iron | | nodular c.i. | | st.st. |
| 0120* | 1 | impeller | c.i. | bronze | c.i. | bronze | st.st. |
| 0130* | 1 | wear ring | c.i. | bronze | c.i. | bronze | st.st. |
| 0230* | 1 | gasket | - - | | | | |
| 0300* | 1 | gasket | - - | | | | |
| 0310 | 1 | plug | steel | | | | st.st. |
| 0315 | 1 | sealing ring | copper | | | | gylon |
| 0320 | 1 | plug | steel | | | | st.st. |
| 0325 | 1 | sealing ring | copper | | | | gylon |
| 0800 | 1) | Allen screw | stainless steel | | | | |
| 0850 | 2) | Allen screw | stainless steel | | | | |
| 1000 | 1 | intermediate cover | nodular c.i. | | | | st.st. |
| 1010 | 1 | plug | stainless steel | | | | |
| 1011 | 1 | plug / PT100 | stainless steel / - - | | | | |
| 1015 | 1 | sealing ring | gylon | | | | |
| 1820* | 1 | cap nut | stainless steel | | | | |
| 1840 | 3) | key | stainless steel | | | | |
| 1860* | 1 | key | stainless steel | | | | |
| 2450 | 1 | impeller shaft | stainless steel | | | | |

c.i. = cast iron st.st. = stainless steel

1) Quantity depending on pump type 4, 8 or 12

2) Quantity depending on pump type 4, 8 or 12

3) MAG110: 1, MAG135: 1, MAG165: 2

9.3.2 Parts list complete magnetic coupling MAG 110 / MAG 135 / MAG 165

| Item | Quantity | Description | Materials |
|---|---|---|---|
| 1200 | 1 | inner rotor | stainless steel |
| 1210 | 1 | outer rotor | steel |
| 1220 | 1 | shaft sleeve | silicon-carbide |
| 1230 | 1 | plain bearing | silicon-carbide / stainless steel |
| 1240 | 1 | axial bearing, motor side | silicon-carbide / stainless steel |
| 1250 | 1 | axial bearing, pump side | silicon-carbide / stainless steel |
| 1260 | 5 | Allen screw | stainless steel |
| 1270 | 1) | Allen screw | stainless steel |
| 1280** | 4 | Allen screw | stainless steel |
| 1290 | 1 | washer | stainless steel |
| 1300 | 1 | bolt | stainless steel |
| 1305 | 1 | disc spring | stainless steel |
| 1310 | 1 | carrier pin | stainless steel |
| 1320 | 1 | containment can | - - |

1) MAG110: 12, MAG135: 16, MAG165: 12

** Part of complete delivery

## 9.4 Roller bearing L1 grease lubricated, MAG 75

### 9.4.1 Sectional drawing

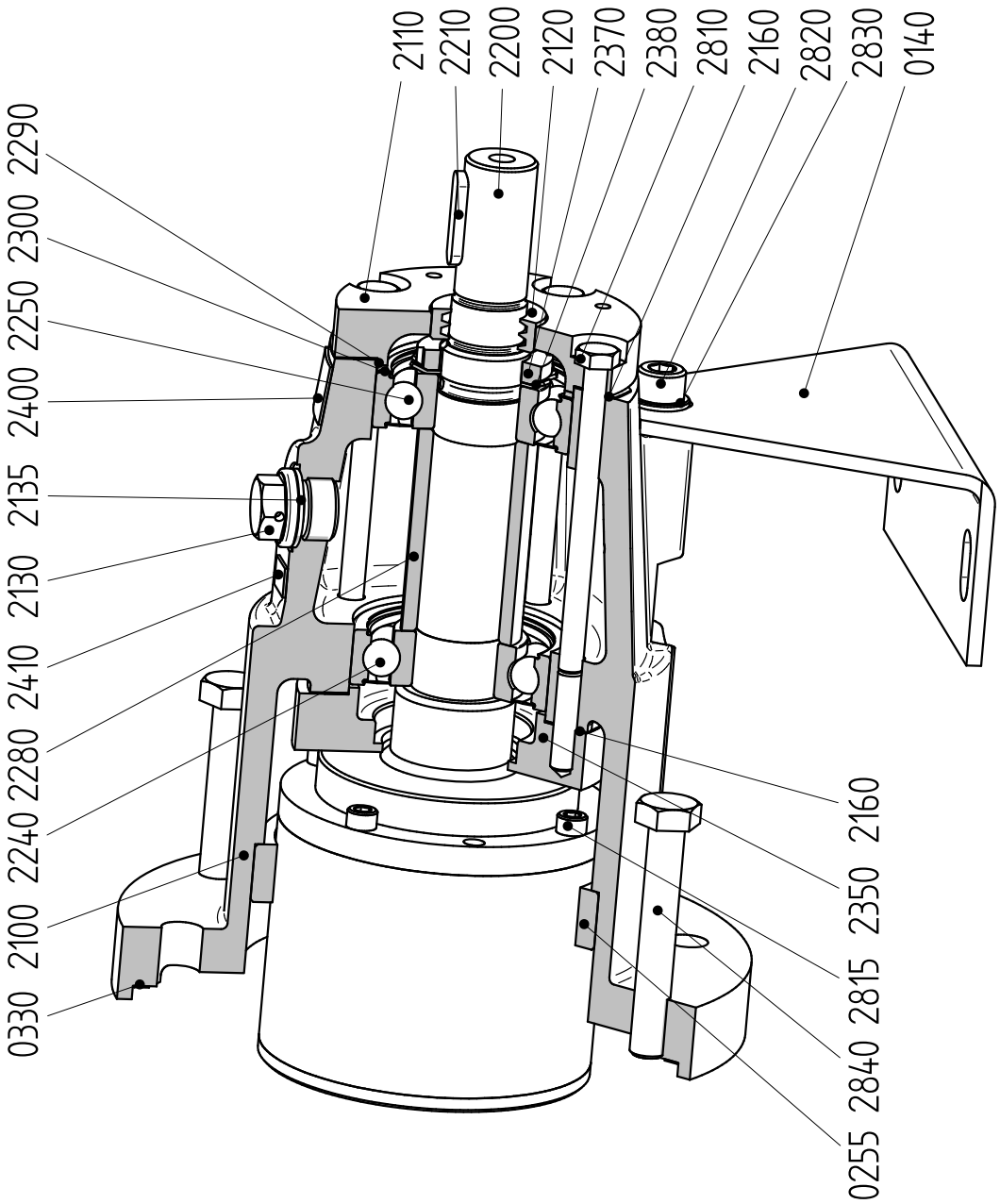


*Figure 24: Roller bearing L1 grease lubricated, MAG 75*

9.4.2 Parts list

| Item | Quantity | Description | Material | | |
|---|---|---|---|---|---|
| | | | G | NG | R6 |
| 0140 | 1 | bracket support | steel | | |
| 0255 | 1 | protection ring | bronze | | |
| 0330* | 1 | gasket | - - | | |
| 2100 | 1 | bearing bracket | nodular cast iron | | |
| 2110 | 1 | bearing cover | steel | | |
| 2120* | 1 | oil catcher | bronze | | |
| 2130 | 1 | oil filler cap | steel | | |
| 2140 | 1 | plug | steel | | |
| 2145 | 1 | plug | steel | | |
| 2160* | 2 | gasket | - - | | |
| 2190 | 1 | plug | steel | | |
| 2195 | 1 | sealing ring | copper | | |
| 2200 | 1 | line shaft | steel | | |
| 2210* | 1 | coupling key | steel | | |
| 2240* | 1 | ball bearing | - - | | |
| 2250* | 1 | ball bearing | - - | | |
| 2280 | 1 | spacer sleeve | steel | | |
| 2290 | 1 | adjusting ring | steel | | |
| 2300* | 1 | waved washer | stainless steel | | |
| 2350 | 1 | bearing cover | steel | | |
| 2370* | 1 | lock nut | steel | | |
| 2380* | 1 | locking washer | steel | | |
| 2400 | 1 | name plate | stainless steel | | |
| 2410 | 1 | arrow plate | aluminium | | |
| 2810 | 4 | bolt | steel | | |
| 2815 | 4 | Allen screw | stainless steel | | |
| 2820 | 1 | Allen screw | stainless steel | | |
| 2830 | 1 | washer | stainless steel | | |
| 2840 | 2 | bolt | stainless steel | | |

## 9.5 Roller bearing L1 grease lubricated

### 9.5.1 Sectional drawing

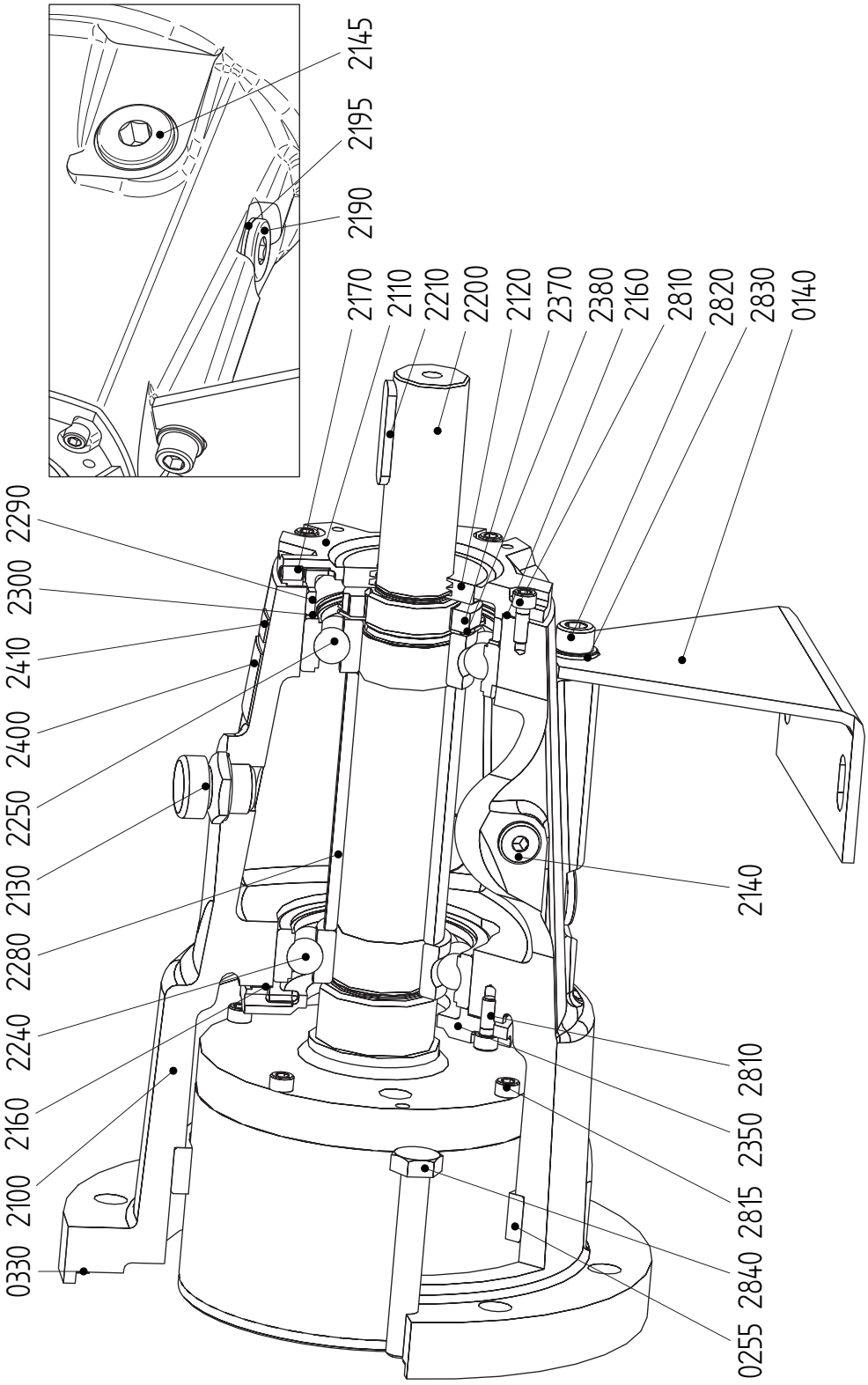


*Figure 25: Roller bearing L1 grease lubricated*

9.5.2 Parts list

| Item | Quantity | Description | Material | | |
|---|---|---|---|---|---|
| | | | G | NG | R6 |
| 0140 | 1 | bracket support | steel | | |
| 0255 | 1 | protection ring | bronze | | |
| 0330* | 1 | gasket | - - | | |
| 2100 | 1 | bearing bracket | nodular cast iron | | |
| 2110 | 1 | bearing cover | cast iron | | |
| 2120* | 1 | oil catcher | bronze | | |
| 2130 | 1 | oil filler cap | steel | | |
| 2140 | 1 | plug | steel | | |
| 2145 | 1 | plug | steel | | |
| 2160* | 2 | gasket | - - | | |
| 2170 | 1 | set screw | stainless steel | | |
| 2190 | 1 | plug | steel | | |
| 2195 | 1 | sealing ring | copper | | |
| 2200 | 1 | line shaft | steel | | |
| 2210* | 1 | coupling key | steel | | |
| 2240* | 1 | ball bearing | - - | | |
| 2250* | 1 | ball bearing | - - | | |
| 2280 | 1 | spacer sleeve | steel | | |
| 2290 | 1 | adjusting ring | steel | | |
| 2300* | 1 | waved washer | spring steel | | |
| 2350 | 1 | bearing cover | cast iron | | |
| 2370* | 1 | lock nut | steel | | |
| 2380* | 1 | locking washer | steel | | |
| 2400 | 1 | name plate | stainless steel | | |
| 2410 | 1 | arrow plate | aluminium | | |
| 2810 | 8 | Allen screw | stainless steel | | |
| 2815 | 4 | Allen screw | stainless steel | | |
| 2820 | 1 | Allen screw | stainless steel | | |
| 2830 | 1 | washer | stainless steel | | |
| 2840 | 2 | bolt | stainless steel | | |

## 9.6 Roller bearing L3 oil lubricated, MAG 75

### 9.6.1 Sectional drawing

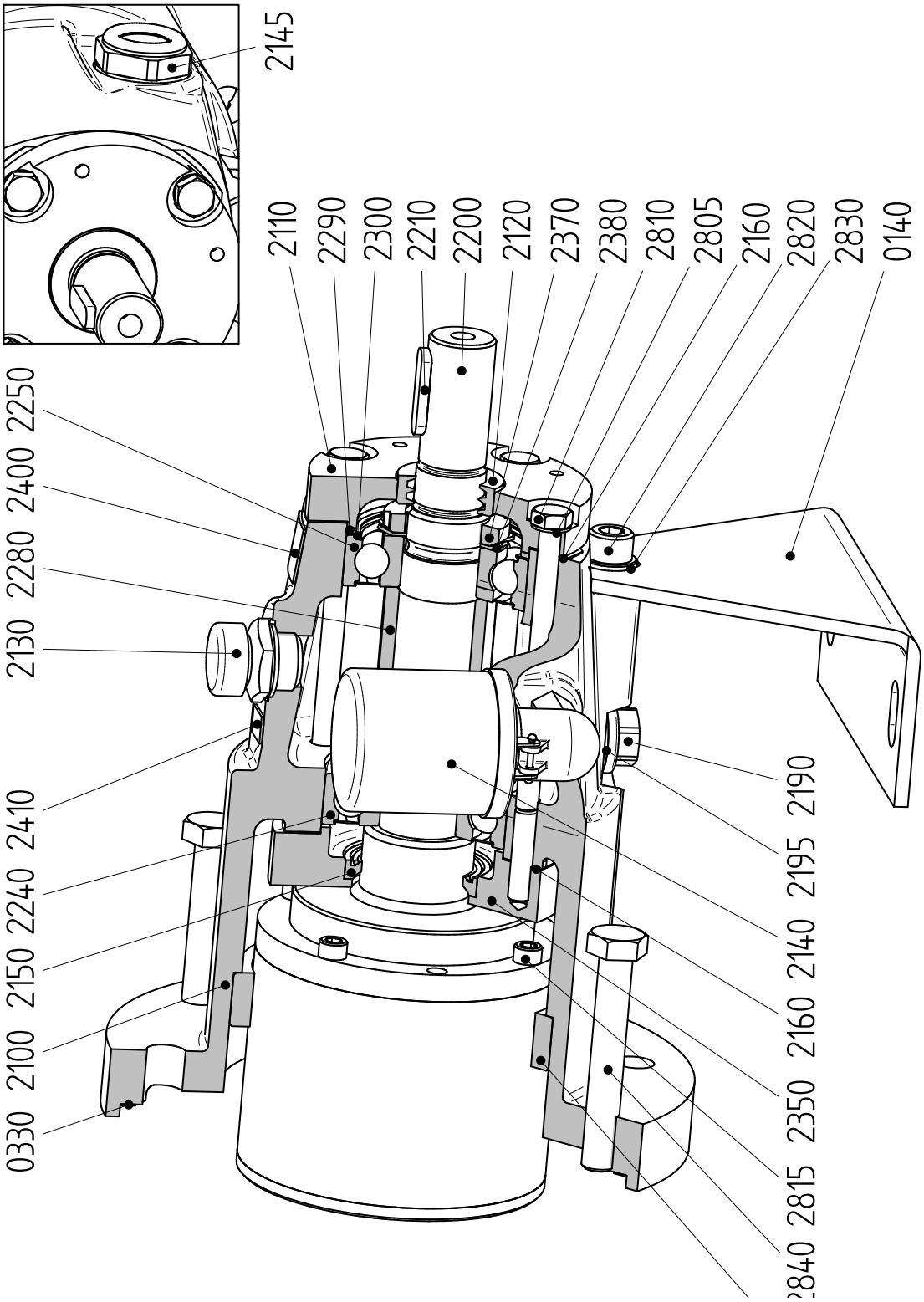


*Figure 26: Roller bearing L3 oil lubricated, MAG 75.*

9.6.2 Parts list

| Item | Quantity | Description | Material | | |
|---|---|---|---|---|---|
| | | | G | NG | R6 |
| 0140 | 1 | bracket support | steel | | |
| 0255 | 1 | protection ring | bronze | | |
| 0330* | 1 | gasket | - - | | |
| 2100 | 1 | bearing bracket | nodular cast iron | | |
| 2110 | 1 | bearing cover | cast iron | | |
| 2120* | 1 | oil catcher | bronze | | |
| 2130 | 1 | oil filler cap | stainless steel | | |
| 2140 | 1 | constant level oiler | - - | | |
| 2145 | 1 | oil sight glass | - - | | |
| 2150* | 1 | oil seal | rubber | | |
| 2160* | 2 | gasket | oil tight | | |
| 2190 | 1 | magnetic drain plug | stainless steel | | |
| 2195 | 1 | sealing ring | gylon | | |
| 2200 | 1 | line shaft | steel | | |
| 2210* | 1 | coupling key | steel | | |
| 2240* | 1 | ball bearing | - - | | |
| 2250* | 1 | ball bearing | - - | | |
| 2280 | 1 | spacer sleeve | steel | | |
| 2290 | 1 | adjusting ring | steel | | |
| 2300* | 1 | waved washer | spring steel | | |
| 2350 | 1 | bearing cover | cast iron | | |
| 2370* | 1 | lock nut | steel | | |
| 2380* | 1 | locking washer | steel | | |
| 2400 | 1 | name plate | stainless steel | | |
| 2410 | 1 | arrow plate | aluminium | | |
| 2810 | 4 | bolt | steel | | |
| 2805 | 4 | multi seal | steel/NBR | | |
| 2815 | 4 | Allen screw | stainless steel | | |
| 2820 | 1 | Allen screw | stainless steel | | |
| 2830 | 1 | washer | stainless steel | | |
| 2840 | 2 | bolt | stainless steel | | |

## 9.7 Roller bearing L3 oil lubricated

9.7.1 Sectional drawing

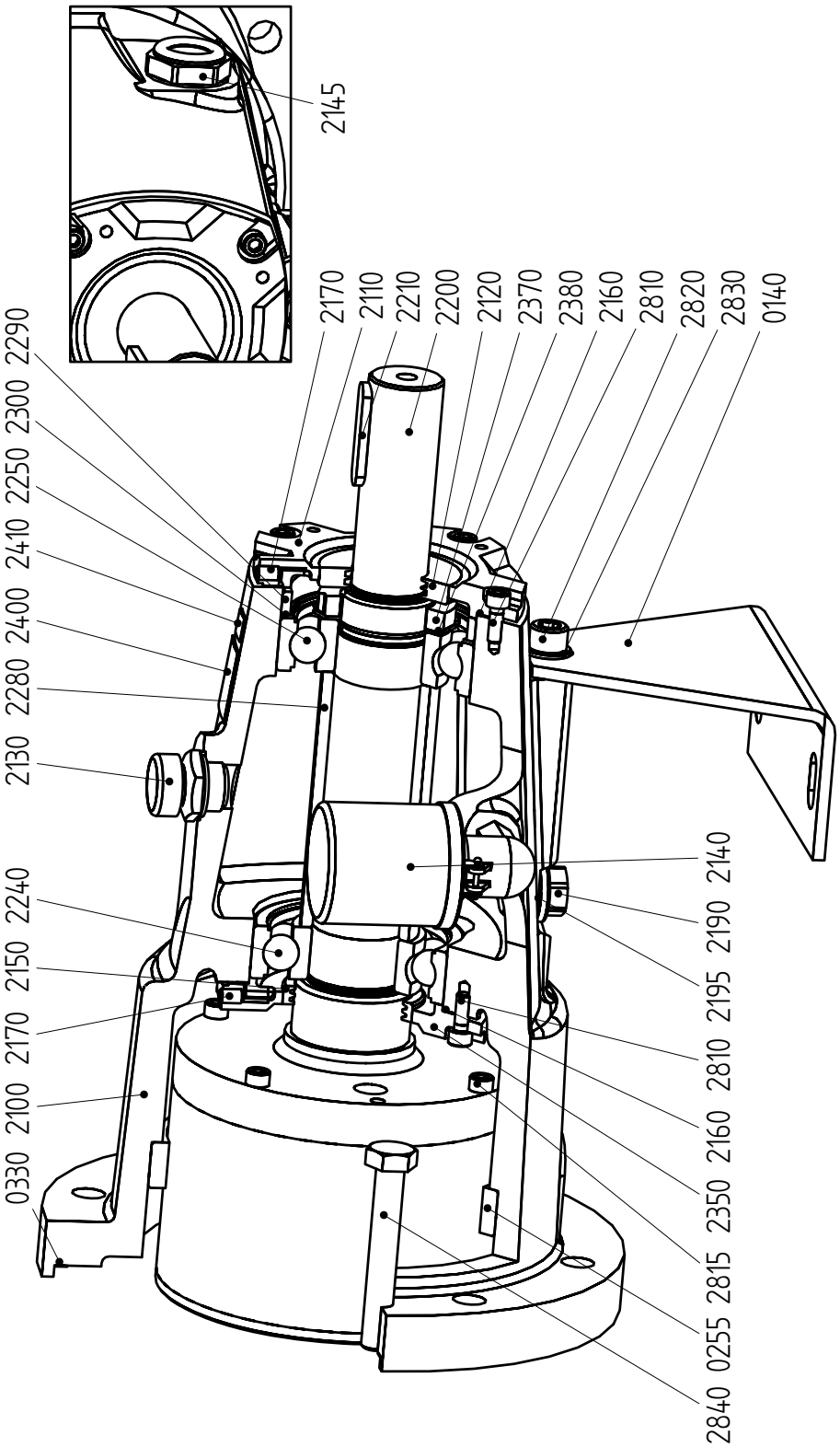


*Figure 27: Roller bearing L3 oil lubricated*

9.7.2 Parts list

| Item | Quantity | Description | Material | | |
|---|---|---|---|---|---|
| | | | G | NG | R6 |
| 0140 | 1 | bracket support | steel | | |
| 0255 | 1 | protection ring | bronze | | |
| 0330* | 1 | gasket | - - | | |
| 2100 | 1 | bearing bracket | nodular cast iron | | |
| 2110 | 1 | bearing cover | cast iron | | |
| 2120* | 1 | oil catcher | bronze | | |
| 2130 | 1 | oil filler cap | steel | | |
| 2140 | 1 | constant level oiler | - - | | |
| 2145 | 1 | oil sight glass | - - | | |
| 2150* | 1 | oil catcher | bronze | | |
| 2160* | 2 | gasket | - - | | |
| 2170 | 2 | set screw | stainless steel | | |
| 2190 | 1 | magnetic drain plug | stainless steel | | |
| 2195 | 1 | sealing ring | gylon | | |
| 2200 | 1 | line shaft | steel | | |
| 2210* | 1 | coupling key | steel | | |
| 2240* | 1 | ball bearing | - - | | |
| 2250* | 1 | ball bearing | - - | | |
| 2280 | 1 | spacer sleeve | steel | | |
| 2290 | 1 | adjusting ring | steel | | |
| 2300* | 1 | waved washer | spring steel | | |
| 2350 | 1 | bearing cover | cast iron | | |
| 2370* | 1 | lock nut | steel | | |
| 2380* | 1 | locking washer | steel | | |
| 2400 | 1 | name plate | stainless steel | | |
| 2410 | 1 | arrow plate | aluminium | | |
| 2810 | 8 | Allen screw | stainless steel | | |
| 2815 | 4 | Allen screw | stainless steel | | |
| 2820 | 1 | Allen screw | stainless steel | | |
| 2830 | 1 | washer | stainless steel | | |
| 2840 | 2 | bolt | stainless steel | | |

## 9.8 Jacket

### 9.8.1 Composite drawing

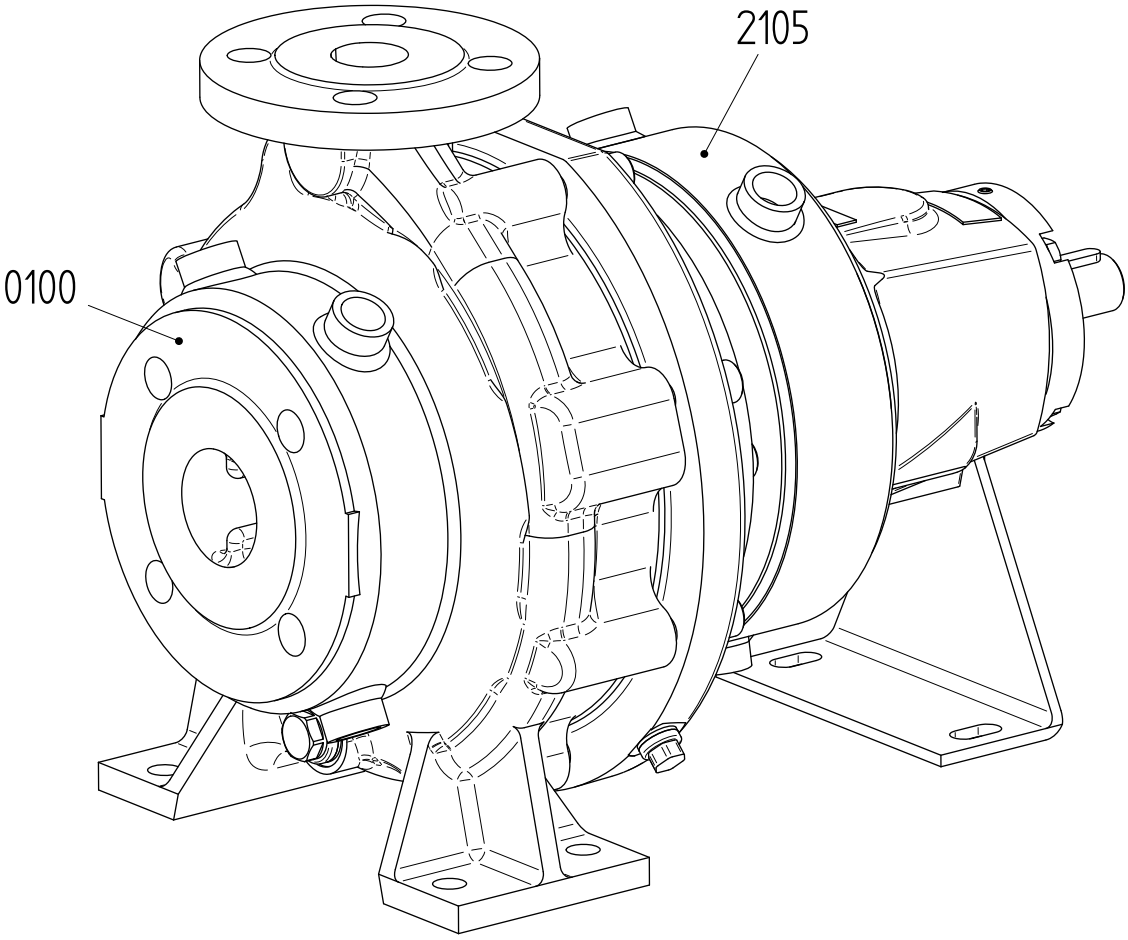


*Figure 28: Jacket.*

### 9.8.2 Parts list

| Item | Quantity | Description | Materials | | |
|---|---|---|---|---|---|
| | | | G | NG | R6 |
| 0100 | 1 | pump casing jacket | -- | | stainless steel |
| 2105 | 1 | bearing bracket jacket | steel | | |

# 10 Technical data

## 10.1 Maximum allowable working pressures

*Table 10: Maximum allowable working pressure [kPa] (according to ISO 7005-2/3).*

| Materials | Max. temperature [°C] | | | | | | |
|---|---|---|---|---|---|---|---|
| | 50 | 120 | 150 | 180 | 200 | 250 | 300 |
| G | 1600 | 1600 | 1440 | 1340 | 1280 | 1120 | 960 |
| NG | 1600 | 1600 | 1550 | 1500 | 1470 | 1390 | 1280 |
| R | 1600 | 1440 | 1360 | 1300 | 1260 | 1190 | 1110 |

100 kPA = 1 bar
Test pressure: 1,5 x max. working pressure

## 10.2 Torque magnetic coupling

*Table 11: Torque magnetic coupling.*

| Magnetic coupling | | | | Torque [Nm] | | | |
|---|---|---|---|---|---|---|---|
| MAG 75-2 | MAG 75-4 | MAG 75-6 | | 9 | 20 | 30 | |
| MAG 110-2 | MAG 110-4 | MAG 110-6 | | 23,5 | 51,9 | 80,3 | |
| MAG 135-4 | MAG 135-6 | MAG 135-8 | | 80,3 | 124,2 | 168 | |
| MAG 165-4 | MAG 165-6 | MAG 165-8 | MAG 165-10 | 119,7 | 184,8 | 249,9 | 315 |

## 10.3 Recommended locking liquids

*Table 12: Recommended locking liquids.*

| Description | Locking liquid |
|---|---|
| cap nut (1820) | Loctite 243 |
| nut / bolt (1300) | Loctite 243 |
| wear ring (0130) | Loctite 641 |

## 10.4 Oil lubricated bearing L3

10.4.1 Oil

**Pump temperatures up to 140°C**:

*Table 13: Recommended oils according to ISO VG 68 classification for ambient temperatures above 15 °C.*

| | |
|---|---|
| BP | Energol HLP-HM 68 |
| CHEVRON | Rando HDZ 68 |
| CHEVRON | Regal Premium EP 68 |
| EXXONMOBIL | Mobil D.T.E. Oil Heavy Medium |
| EXXONMOBIL | Teresstic T 68 |
| SHELL | Tellus S2 M 68 |
| TOTAL | Azolla ZS 68 |

**When the pumpmedium temperature is over 140°C** a **synthetic oil** with next approximate viscosity characteristic shall be used:

40°C - 145 $mm^2/s$ & 100°C - 24 $mm^2/s$ (e.g. Shell TIVELA WA).

**! This "Polyglycol" based oil is not mixable with mineral oils!**

10.4.2 Oil contents

*Table 14: Oil contents.*

| Bearing group | Oil contents [litres] |
|---|---|
| 1: MAG 75 | 0,40 |
| 1: MAG 110 | 0,50 |
| 2: MAG110, 135, 165 | 0,50 |
| 3: MAG 135, 165 | 0,60 |

## 10.5 Tightening moments

10.5.1 Tightening moments for bolts and Allen screws

*Table 15: Tightening moments in Nm for stainless steel (A4-70) bolts and Allen screws.*

| Thread | lubricated | dry |
|---|---|---|
| M5 | 4 | 4,5 |
| M6 | 7 | 7,5 |
| M8 | 16 | 18 |
| M10 | 32 | must not be fitted dry |
| M12 | 43 | must not be fitted dry |

10.5.2 Tightening moments for cap nut

*Table 16: Tightening moments for cap nut (1820).*

| Thread | Tightening moment [Nm] |
|---|---|
| M12 (bearing group 1) | 43 |
| M16 (bearing group 2) | 105 |
| M 24 (bearing group 3) | 220 |

## 10.6 Maximum speed

*Table 17: Maximum speed.*

| CM | Max. impeller diameter [mm] | Back vane diameter [mm] | Max. speed [$min^{-1}$] |
|---|---|---|---|
| 32-125 | 139 | 76* | 3600 |
| 32C-125 | 139 | 76 | 3600 |
| 32-160 | 169 | 76* | 3600 |
| 32A-160 | 169 | -- | 3600 |
| 32C-160 | 169 | 76 | 3600 |
| 32-200 | 209 | 133* | 3600 |
| 32C-200 | 209 | 133 | 3600 |
| 32-250 | 260 | 161 | 3600 |
| 40C-125 | 130 | 76 | 3600 |
| 40C-160 | 175 | 120 | 3600 |
| 40C-200 | 210 | 111 | 3600 |
| 40-250 | 260 | 150 | 3600 |
| 40A-315 | 320 | 164 | 3600 |
| 50C-125 | 139 | 115 | 3600 |
| 50C-160 | 175 | 118 | 3600 |
| 50C-200 | 209 | 155 | 3600 |
| 50-250 | 260 | 160 | 3600 |
| 50-315 | 320 | 208 | 3600 |
| 65C-125 | 139 | 139 | 3600 |
| 65C-160 | 175 | 156 | 3600 |
| 65C-200 | 215 | 157 | 3600 |
| 65A-250 | 260 | 193 | 3600 |
| 65-315 | 320 | 200 | 3600 |
| 80C-160 | 175 | 175 | 3600 |
| 80C-200 | 215 | 180 | 3600 |
| 80-250 | 260 | 225 | 3600 |
| 80A-250 | 265 | 225 | 3600 |
| 80-315 | 320 | 239 | 3600 |
| 80-400 | 410 | 290 | 1800 |
| 100C-200 | 220 | 200 | 3000 |
| 100C-250 | 269 | 269 | 3000 |
| 100-315 | 324 | 243 | 1800 |
| 100-400 | 410 | 243 | 1800 |
| 125-250 | 269 | 234 | 1800 |
| 125-315 | 324 | 272 | 1800 |
| 125-400 | 404 | 299 | 1800 |
| 150-400 | 414 | 342 | 1800 |

* stainless steel impeller: no back vanes

## 10.7 Permissible forces and moments on the flanges

Forces and moments acting on the pump flanges due to pipe loads can cause misalignment of the pump and driver shafts, deformation and overstressing of the pump casing, or overstressing of the fixing bolts between the pump and the base plate.

The maximum allowable forces and moments on the flanges should be based on the following maximum values for the lateral displacement of the shaft end, relative to the fixed point in space:

- pumps of bearing group 1: 0,15 mm,
- pumps of bearing group 2: 0,20 mm,
- pumps of bearing group 3: 0,25 mm,

The values can be applied simultaneously in all directions with positive or negative signs, or separately on each flange (suction and discharge).

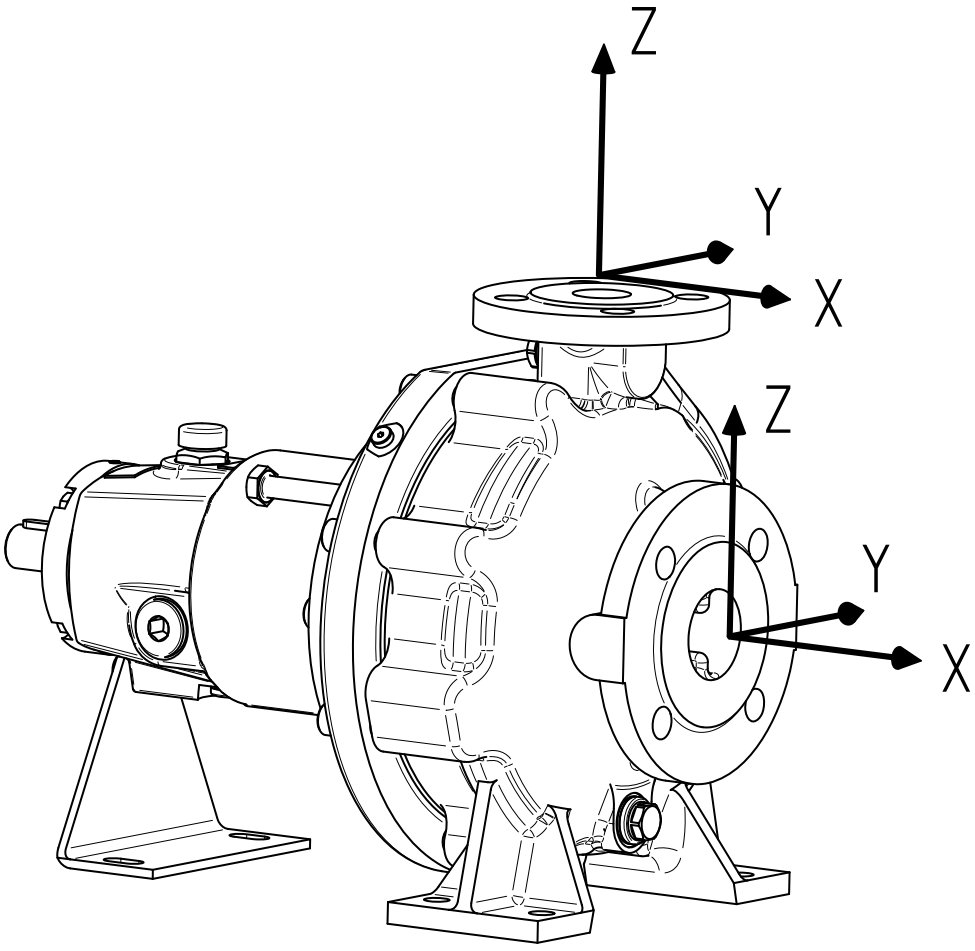


*Figure 29: Coordinate system.*

*Table 18: Permissible forces and moments on the flanges, based on EN-ISO 5199.*

| CM | Pump unit with a non-grouted base plate | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Horizontal Pump, End branch, x-Axis | | | | | | | | Horizontal Pump, Top branch, z-Axis | | | | | | | |
| | Force (N) | | | | Moment (N.m) | | | | Force (N) | | | | Moment (N.m) | | | |
| | Fy | Fz | Fx | ΣF | My | Mz | Mx | ΣM | Fy | Fz | Fx | ΣF | My | Mz | Mx | ΣM |
| 32-125 | 1050 | 945 | 1155 | 1820 | 700 | 805 | 980 | 1435 | 595 | 735 | 630 | 1155 | 525 | 595 | 770 | 1120 |
| 32C-125 | 1050 | 945 | 1155 | 1820 | 700 | 805 | 980 | 1435 | 595 | 735 | 630 | 1155 | 525 | 595 | 770 | 1120 |
| 32-160 | 1050 | 945 | 1155 | 1820 | 700 | 805 | 980 | 1435 | 595 | 735 | 630 | 1155 | 525 | 595 | 770 | 1120 |
| 32A-160 | 1050 | 945 | 1155 | 1820 | 700 | 805 | 980 | 1435 | 595 | 735 | 630 | 1155 | 525 | 595 | 770 | 1120 |
| 32C-160 | 1050 | 945 | 1155 | 1820 | 700 | 805 | 980 | 1435 | 595 | 735 | 630 | 1155 | 525 | 595 | 770 | 1120 |
| 32-200 | 1050 | 945 | 1155 | 1820 | 700 | 805 | 980 | 1435 | 595 | 735 | 630 | 1155 | 525 | 595 | 770 | 1120 |
| 32C-200 | 1050 | 945 | 1155 | 1820 | 700 | 805 | 980 | 1435 | 595 | 735 | 630 | 1155 | 525 | 595 | 770 | 1120 |
| 32-250 | 1050 | 945 | 1155 | 1820 | 700 | 805 | 980 | 1435 | 595 | 735 | 630 | 1155 | 525 | 595 | 770 | 1120 |
| 40C-125 | 1295 | 1190 | 1470 | 2310 | 770 | 840 | 1050 | 1540 | 700 | 875 | 770 | 1365 | 630 | 735 | 910 | 1330 |
| 40C-160 | 1295 | 1190 | 1470 | 2310 | 770 | 840 | 1050 | 1540 | 700 | 875 | 770 | 1365 | 630 | 735 | 910 | 1330 |
| 40C-200 | 1295 | 1190 | 1470 | 2310 | 770 | 840 | 1050 | 1540 | 700 | 875 | 770 | 1365 | 630 | 735 | 910 | 1330 |
| 40-250 | 1295 | 1190 | 1470 | 2310 | 770 | 840 | 1050 | 1540 | 700 | 875 | 770 | 1365 | 630 | 735 | 910 | 1330 |
| 40A-315 | 1295 | 1190 | 1470 | 2310 | 770 | 840 | 1050 | 1540 | 700 | 875 | 770 | 1365 | 630 | 735 | 910 | 1330 |
| 50C-125 | 1575 | 1435 | 1750 | 2765 | 805 | 910 | 1120 | 1645 | 945 | 1155 | 1050 | 1820 | 700 | 805 | 980 | 1435 |
| 50C-160 | 1575 | 1435 | 1750 | 2765 | 805 | 910 | 1120 | 1645 | 945 | 1155 | 1050 | 1820 | 700 | 805 | 980 | 1435 |
| 50C-200 | 1575 | 1435 | 1750 | 2765 | 805 | 910 | 1120 | 1645 | 945 | 1155 | 1050 | 1820 | 700 | 805 | 980 | 1435 |
| 50-250 | 1575 | 1435 | 1750 | 2765 | 805 | 910 | 1120 | 1645 | 945 | 1155 | 1050 | 1820 | 700 | 805 | 980 | 1435 |
| 50-315 | 1295 | 1435 | 1750 | 2765 | 805 | 910 | 1120 | 1645 | 945 | 1155 | 1050 | 1820 | 700 | 805 | 980 | 1435 |
| 65C-125 | 2100 | 1890 | 2345 | 3675 | 875 | 1015 | 1225 | 1820 | 1190 | 1470 | 1295 | 2310 | 770 | 840 | 1050 | 1540 |
| 65C-160 | 2100 | 1890 | 2345 | 3675 | 875 | 1015 | 1225 | 1820 | 1190 | 1470 | 1295 | 2310 | 770 | 840 | 1050 | 1540 |
| 65C-200 | 2100 | 1890 | 2345 | 3675 | 875 | 1015 | 1225 | 1820 | 1190 | 1470 | 1295 | 2310 | 770 | 840 | 1050 | 1540 |
| 65A-250 | 2100 | 1890 | 2345 | 3675 | 875 | 1015 | 1225 | 1820 | 1190 | 1470 | 1295 | 2310 | 770 | 840 | 1050 | 1540 |
| 65-315 | 2100 | 1890 | 2345 | 3675 | 875 | 1015 | 1225 | 1820 | 1190 | 1470 | 1295 | 2310 | 770 | 840 | 1050 | 1540 |
| 80C-160 | 2485 | 2240 | 2765 | 4340 | 1050 | 1330 | 1470 | 2135 | 1435 | 1750 | 1575 | 2765 | 805 | 910 | 1120 | 1645 |
| 80C-200 | 2485 | 2240 | 2765 | 4340 | 1050 | 1330 | 1470 | 2135 | 1435 | 1750 | 1575 | 2765 | 805 | 910 | 1120 | 1645 |
| 80-250 | 2485 | 2240 | 2765 | 4340 | 1050 | 1330 | 1470 | 2135 | 1435 | 1750 | 1575 | 2765 | 805 | 910 | 1120 | 1645 |
| 80A-250 | 2485 | 2240 | 2765 | 4340 | 1050 | 1330 | 1470 | 2135 | 1435 | 1750 | 1575 | 2765 | 805 | 910 | 1120 | 1645 |
| 80-315 | 2485 | 2240 | 2765 | 4340 | 1050 | 1330 | 1470 | 2135 | 1435 | 1750 | 1575 | 2765 | 805 | 910 | 1120 | 1645 |
| 80-400 | 2485 | 2240 | 2765 | 4340 | 1050 | 1330 | 1470 | 2135 | 1435 | 1750 | 1575 | 2765 | 805 | 910 | 1120 | 1645 |
| 100C-200 | 2485 | 2240 | 2765 | 4340 | 1050 | 1330 | 1470 | 2135 | 1890 | 2345 | 2100 | 3675 | 875 | 1015 | 1225 | 1820 |
| 100C-250 | 2485 | 2240 | 2765 | 4340 | 1050 | 1330 | 1470 | 2135 | 1890 | 2345 | 2100 | 3675 | 875 | 1015 | 1225 | 1820 |
| 100-315 | 2485 | 2240 | 2765 | 4340 | 1050 | 1330 | 1470 | 2135 | 1890 | 2345 | 2100 | 3675 | 875 | 1015 | 1225 | 1820 |
| 100-400 | 2485 | 2240 | 2765 | 4340 | 1050 | 1330 | 1470 | 2135 | 1890 | 2345 | 2100 | 3675 | 875 | 1015 | 1225 | 1820 |
| 125-250 | 3150 | 2835 | 3500 | 5495 | 1225 | 1435 | 1750 | 2555 | 2240 | 2765 | 2485 | 4340 | 1050 | 1330 | 1470 | 2135 |
| 125-315 | 3150 | 2835 | 3500 | 5495 | 1225 | 1435 | 1750 | 2555 | 2240 | 2765 | 2485 | 4340 | 1050 | 1330 | 1470 | 2135 |
| 125-400 | 3150 | 2835 | 3500 | 5495 | 1225 | 1435 | 1750 | 2555 | 2240 | 2765 | 2485 | 4340 | 1050 | 1330 | 1470 | 2135 |
| 150-400* | 4200 | 3780 | 4690 | 7315 | 1610 | 1855 | 2275 | 3360 | 2835 | 3500 | 3150 | 5495 | 1225 | 1435 | 1750 | 2555 |

* Not available in G and NG

The basic values mentioned in the table above should be multiplied with the following coefficients in relation to the relevant pump casing materials:

| Material | Coefficient |
|---|---|
| Cast iron | 0,5 |
| Nodular cast iron | 0,8 |
| Stainless steel | 1 |

## 10.8 Hydraulic performance

10.8.1 Performance overview cast iron and nodular cast iron pumps G, NG

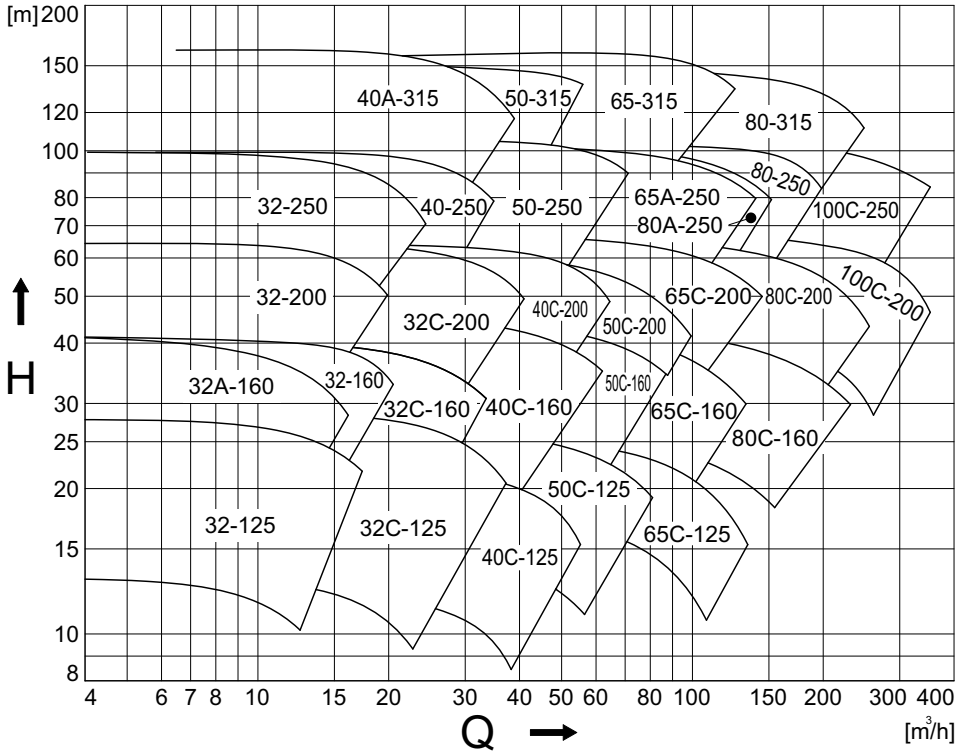


*Figure 30: Performance overview 3000 min$^{-1}$.*

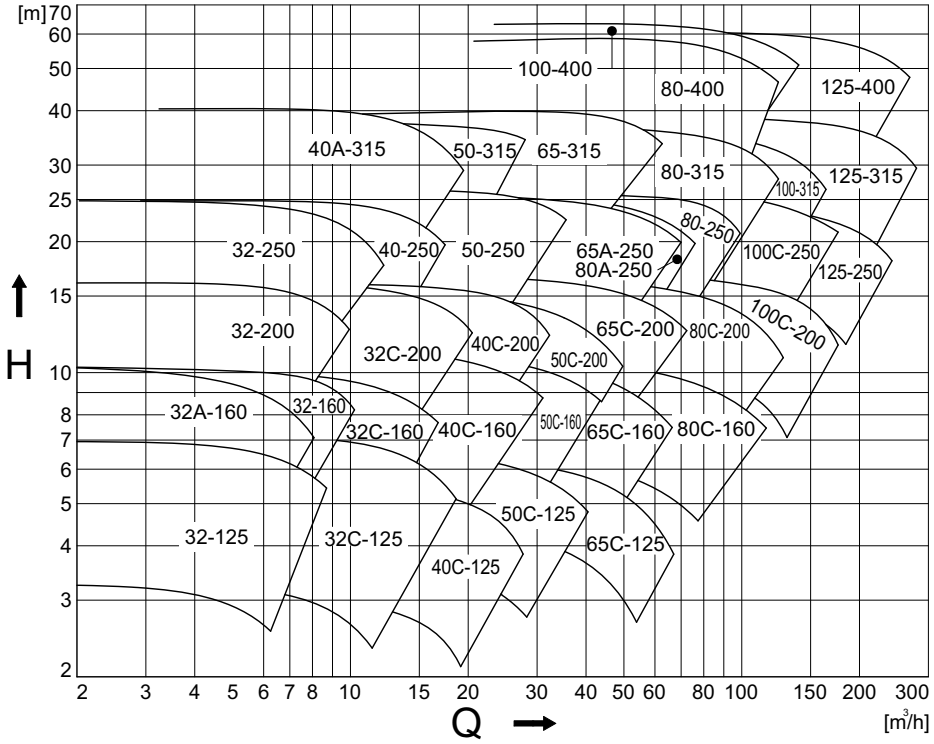


*Figure 31: Performance overview 1500 min$^{-1}$.*

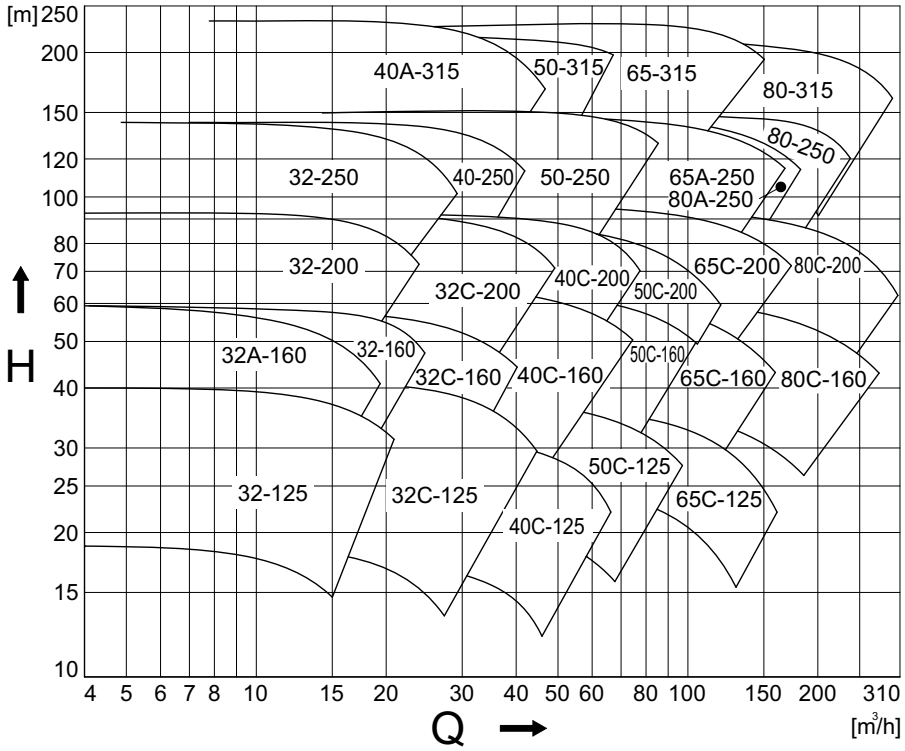


*Figure 32: Performance overview 3600 min$^{-1}$.*

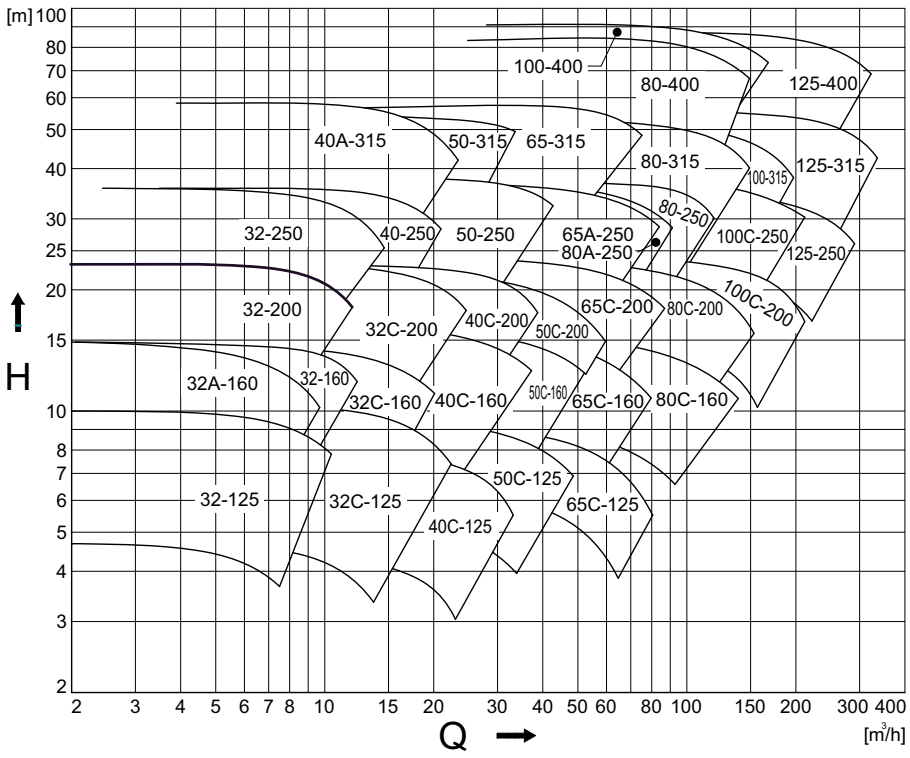


*Figure 33: Performance overview 1800 min$^{-1}$.*

10.8.2 Performance overview stainless steel pumps R

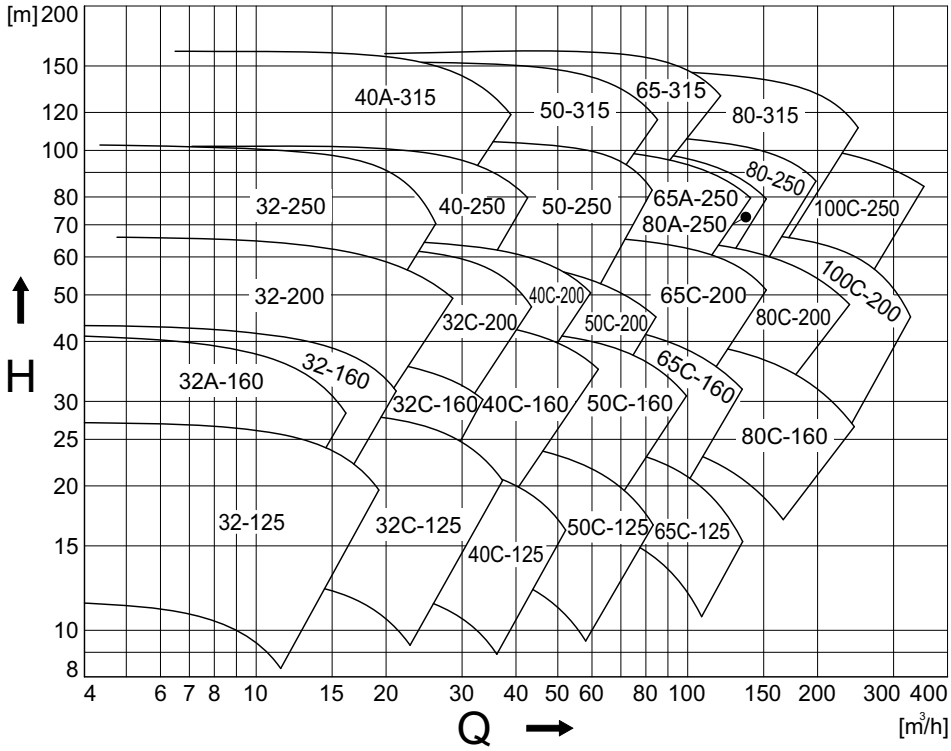


*Figure 34: Performance overview 3000 min$^{-1}$.*

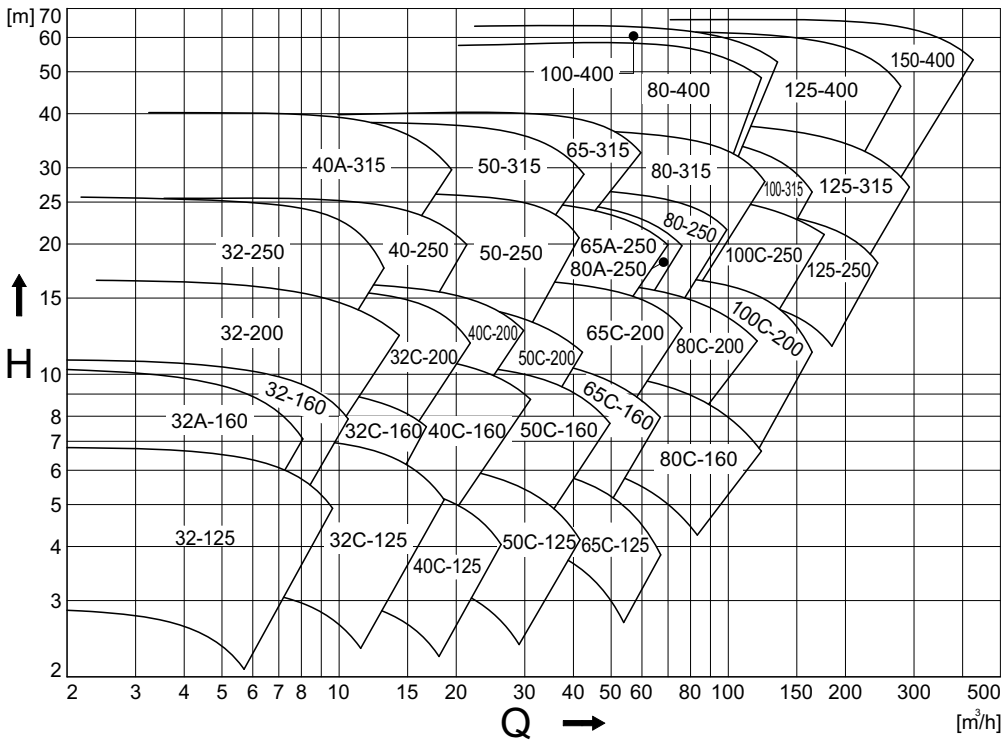


*Figure 35: Performance overview 1500 min$^{-1}$.*

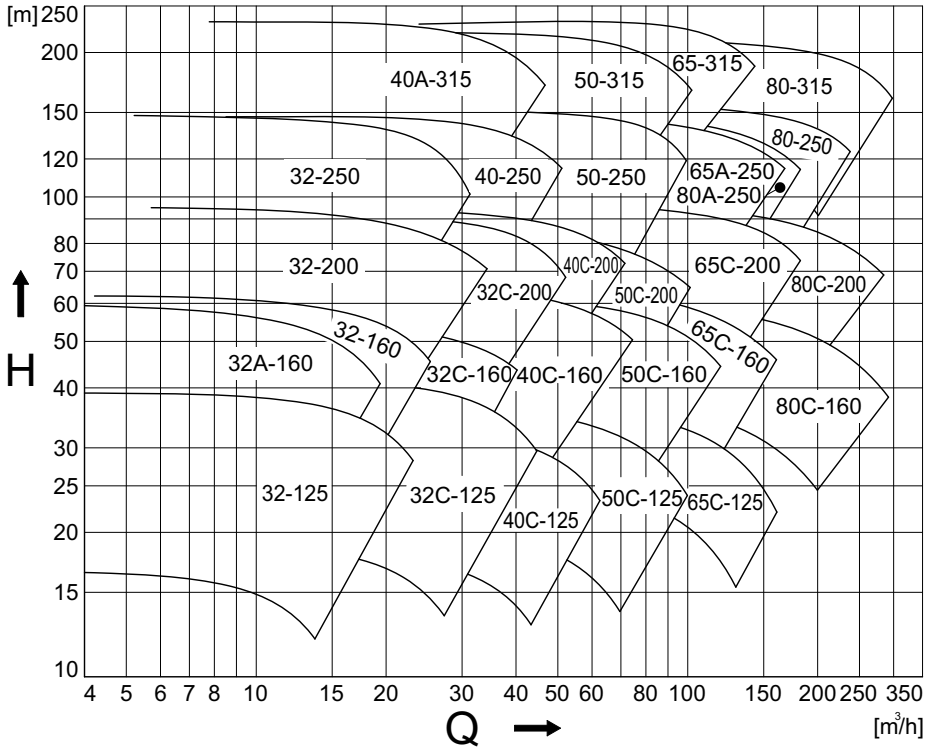


*Figure 36: Performance overview 3600 min$^{-1}$.*

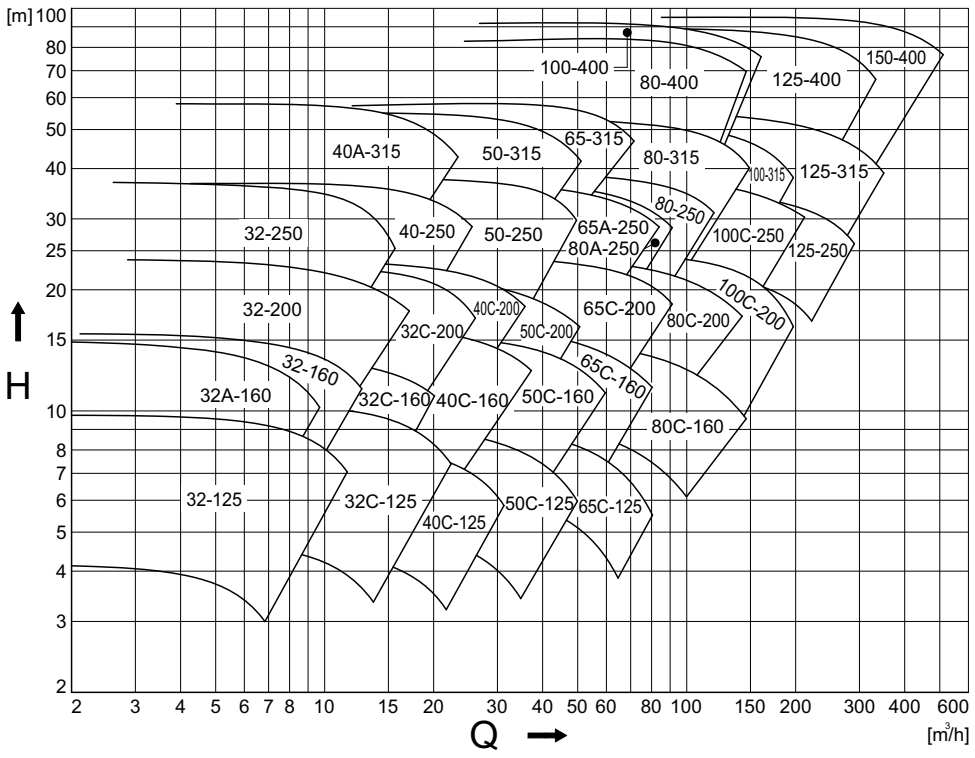


*Figure 37: Performance overview 1800 min$^{-1}$.*

## 10.9 Noise data

10.9.1 Pump noise as a function of pump power

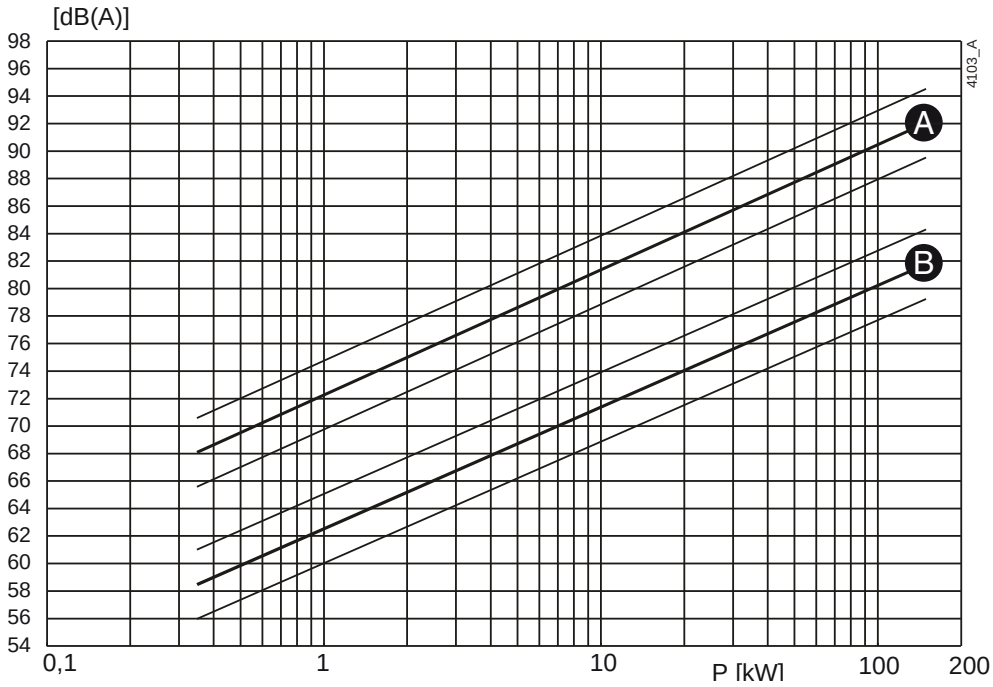


*Figure 38: Noise level as function of pump power [kW] at 1450 min$^{-1}$*
*A = sound power level, B = sound pressure level.*

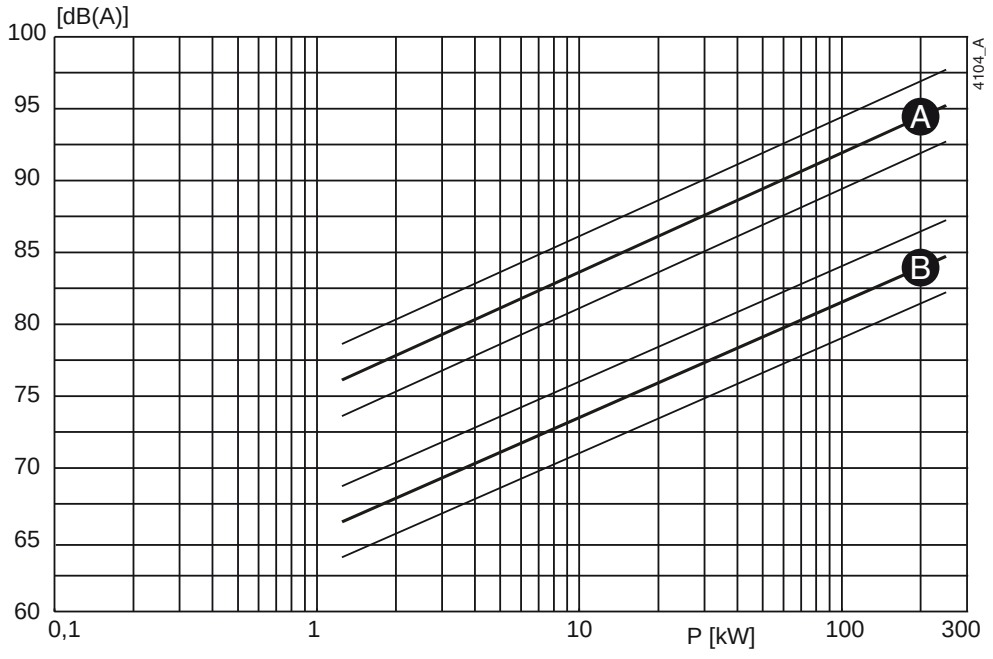


*Figure 39: Noise level as function of pump power [kW] at 2900 min$^{-1}$*
*A = sound power level, B = sound pressure level.*

10.9.2 Noise level of entire pump unit

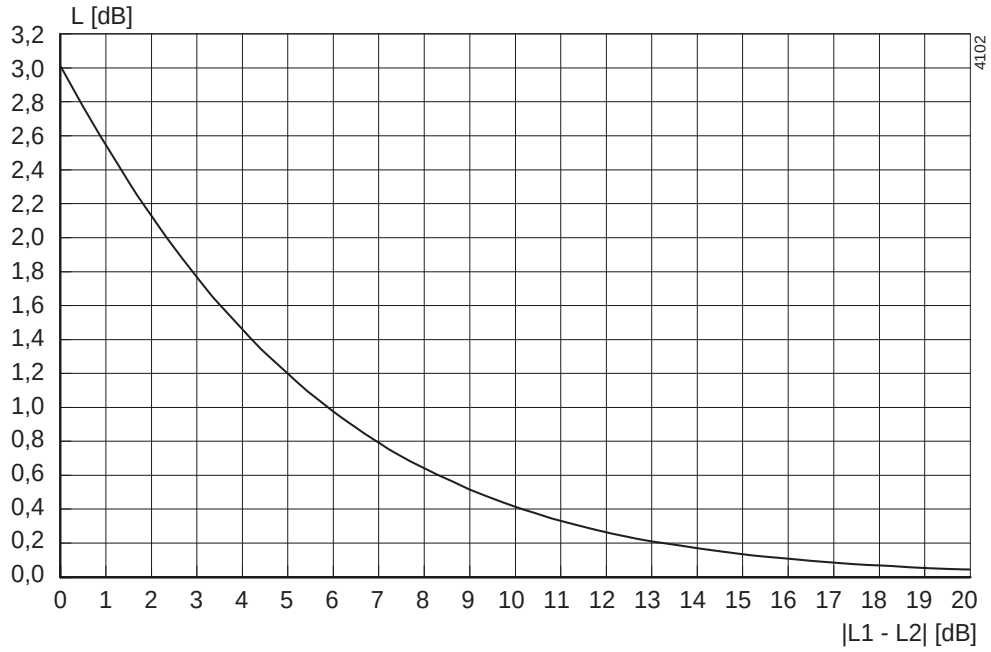


*Figure 40: Noise level of entire pump unit.*

In order to determine the total noise level of the entire pump unit, the noise level of the motor must be added to that of the pump. This can be easily done by using the graph above.

1 Determine the noise level (L1) of the pump, see figure 38 or figure 39.
2 Determine the noise level (L2) of the motor, see documentation of the motor.
3 Determine the difference between both levels |L1 - L2|.
4 Find the differential value on the |L1 - L2|-axis and go up to the curve.
5 From the curve go left to the L[dB] -axis and read out the value.
6 Add this value to the highest value of both noise levels (L1 or L2).

Example:

1 Pump 75 dB; motor 78 dB.
2 |75-78| = 3 dB.
3 3 dB on the X-axis = 1,75 dB on the Y-axis.
4 Highest noise level + 1,75 dB = 78 + 1,75 = 79,75 dB.

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| **Your order number:** | |
| **Pump type:** | |
| **Execution:** | |

| Quantity | Item. No. | Part | Article number pump |
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